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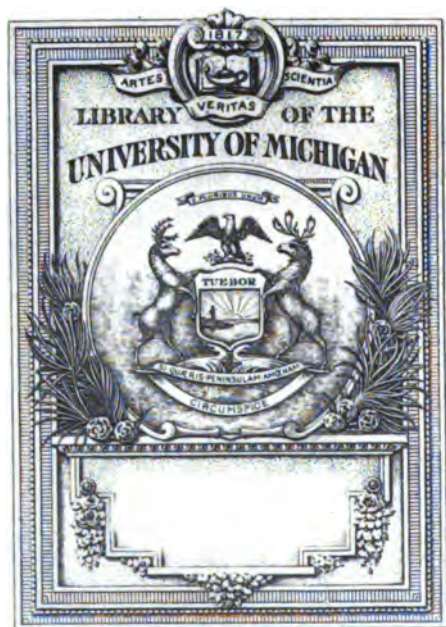
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STATE OF NEW YORK (*State*) *Conservation*
dept.

Conservation Commission

TENTH ANNUAL REPORT

FOR THE YEAR 1920



STATE OF NEW YORK

CONSERVATION COMMISSION

GEORGE D. PRATT.....*Commissioner*
ALEXANDER MACDONALD.....*Deputy Commissioner*
WARWICK S. CARPENTER.....*Secretary*
MARSHALL McLEAN*Counsel*
CLINTON G. ABBOTT.....*Confidential Secretary and Editor*

BIRDS should be saved because of utilitarian reasons; and moreover, they should be saved because of reasons unconnected with any return in dollars and cents. A grove of giant redwoods or sequoias should be kept just as we keep a great and beautiful cathedral. The extermination of the Passenger Pigeon meant that mankind was so much poorer; exactly as in the case of the destruction of the cathedral at Rheims. And to lose the chance to see Frigate-birds soaring in circles above the storm, or a file of Pelicans winging their way homeward across the crimson afterglow of sunset, or a myriad of Terns flashing in the bright light of midday as they hover in a shifting maze above the beach — why, the loss is like the loss of a gallery of the masterpieces of the artists of old time.

— Theodore Roosevelt.

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TENTH ANNUAL REPORT

OF THE

CONSERVATION COMMISSION

To the Legislature:

Pursuant to statute, the Conservation Commission begs to submit, for the consideration of your honorable body, a report of its work for the past year, as well as certain recommendations which it trusts will meet with your approval.

In the text of this report the discussion of the work of the Commission has been carried down to the end of the calendar year, December 31, 1920. Financial and other tables which are directly related to the fiscal year are, however, carried only to the end of the fiscal year, June 30, 1920. This method of preparing the report has been adopted because of the fact that the Legislature each year must consider many questions of conservation which require knowledge of the Commission's doings down to date, and not merely information that is already six months old.

The report is followed by the report of a committee authorized by a concurrent resolution of the Legislature, to formulate a program of forest and wild life conservation.

Under the statute the work of the Commission is grouped into four divisions. This report accordingly considers each division in turn, preceding them, however, with a discussion of general topics. This is followed by the report of the Conservation Bureau of the Attorney-General's office and the Annual Financial Statement of the Commission. The arrangement is as follows:

- I. General Topics.
- II. Division of Fish and Game.
- III. Division of Lands and Forests.
- IV. Division of State Reservation at Saratoga Springs.
- V. Conservation Bureau. Attorney-General's Office.
- VI. Financial Statement of the Conservation Commission.
- VII. Report under Concurrent Resolution of the Legislature.

GENERAL TOPICS

[3]



THE SONG OF TAHAWUS

I am tallest of the mountains where the many mountains rise —
I am Cleaver of the Cloudland and the Splitter of the Skies —
I am keeper of the caverns where the God of thunder sleeps —
I am older than the waters that once hid me in their deeps.

For the eyes I hold the visions of the things that make men whole —
Of the woodlands and the waters that can whisper to the soul.
In the winter robed in whiteness, in the summer garbed in green
I am warden of the wonders of an ever-shifting scene.

I am guardian of the goblet that is filled with hopes of life
For the weary and the broken, and the wounded in the strife;
And I offer them the freedom of my great cathedral shrine,
With its sanctity of silence and its fragrance of the pine.

For I crave to be the symbol of the strength that won the fight,
Of the spirit of the heroes who fell battling for the right.
For those dead who died to save us, let me say eternal mass,
And be God's volcanic voicing of the words: "They shall not pass."

— Alfred L. Donaldson.

GENERAL TOPICS

RECEIPTS AND DISBURSEMENTS

The receipts of the Conservation Commission for the fiscal year ending June 30, 1920, exclusive of the Division of Saratoga Springs, were \$456,869.33. This was an increase of \$58,957.53 over the receipts of the preceding year, and accordingly indicates the most financially prosperous year which the Commission has ever experienced. The receipts for the last five years have steadily mounted, and have gone far to offset the rapidly rising cost of all supplies, and the increased cost of living which of necessity had to be reflected in higher salaries.

The disbursements for the fiscal year ending June 30, 1919, exclusive of the Division of Saratoga Springs and Forest Preserve Fund disbursements, which are really investments in forest land, were \$910,461.17. On the same basis, the disbursements for the fiscal year ending June 30, 1920, were \$1,058,643.74. This is an increase of \$148,182.57. The increase in receipts, however, when subtracted from this increase in disbursements, shows that the actual net increase in the cost to the State of operating the Conservation Commission during the last fiscal year, exclusive of the State Reservation at Saratoga Springs, was only \$89,225.04. This is an increase of only 9.7 per cent over the disbursements of 1919, which is actually less than the prevailing increase in prices in the country at large during the same period. These figures include all construction costs, which are really permanent improvements and in ordinary business would not be entirely charged off in one year.

The increased productivity of the game farms and fish hatcheries and the increased effectiveness with which the State's resources of forests and wild life are protected, more than offset the slightly increased cost of operation.

Saratoga Division. The financial condition of the Saratoga Division showed the same gratifying improvement throughout the year, except for the fact that on March 1, 1920, the bottling

and sale of the waters was turned over to a private corporation under a lease executed by the former Commissioners and upheld by the Court of Appeals. This deprived the Commission of the gross revenue from the sale of waters and from admissions to the Drink Hall for a period of four months, without, however, effecting a corresponding reduction in expenses. This very materially affected the net results of the year, and reduced the profit of the income producing department of the Reservation to a nominal sum of \$223.61. It is estimated that had the Reservation had the receipts from the sale of water, its income would have been in the neighborhood of \$20,000 greater, and would have given the Reservation the most financially successful year of its existence.

The marked increase in business is well illustrated by comparison of the receipts and costs of operation of the Saratoga and Lincoln bath houses in the fiscal years ending on June 30, 1919 and 1920, respectively.

SARATOGA BATH HOUSE

Year	Receipts	Operation	Profit
1919	\$14,420 96	\$13,135 09	\$1,285 87
1920	22,044 97	17,461 91	4,583 06

LINCOLN BATH HOUSE

Year	Receipts	Operation	Profit
1919	\$11,171 12	\$5,987 09	\$5,184 03
1920	20,221 67	8,461 44	11,760 23

These are not net profits, since certain proportions of general plant service expense have to be borne by both bath houses, but they are statements of receipts and disbursements made on the same basis for both years, and accurately reflect the improved financial condition of the mineral water bath business at the State Reservation. Had the entire Reservation continued to remain under State control, the condition of every department would have shown the same satisfactory improvement.

Economy of Administration. At a time when economy of administration is essential, it will be helpful to analyze carefully the exact net cost of the Conservation Commission to the people

of the State since 1915. The net cost each year is found by deducting the total receipts in cash from the total disbursements. This has been done in the following table. Investments in forest land, however, have not been considered, because they are actually investments paid out of a special fund, and cannot properly be considered in a discussion of net operating costs. The same reasoning might be held to apply to new constructions, but it has not been resorted to in the following table. The table accordingly shows the full net cost to the people of the State of the operation of the Conservation Commission for a period of six years, and includes new constructions, repairs, alterations, and betterments, which in a time of rapidly rising prices have necessarily had a considerable effect upon the total expenditures.

NET COST OF OPERATION OF THE CONSERVATION COMMISSION

1915-1920

Fiscal year ending	Disbursements	Receipts	Net cost
September 30, 1915.....	\$702,124 66	\$321,568 77	\$380,555 89
June 30, 1916.....	607,861 54	347,979 06	259,882 48

(The reduced net cost in 1916 is due partly to an increase in receipts, but partly to the fact that the fiscal year was three months shorter.)

June 30, 1917.....	\$979,962 82	\$462,134 17	\$517,828 65
--------------------	--------------	--------------	--------------

(This is a fiscal year of twelve full months. The State Reservation at Saratoga Springs was placed under the jurisdiction of this Commission just prior to the opening of this fiscal year, and accordingly the expenses of the non-income producing departments of that Reservation became a material factor for the first time in this year's net cost of the Conservation Commission. Included in these Saratoga expenses are \$94,143.82 paid for land appropriated by the former Reservation Commission without available funds. If this payment for an old debt is subtracted from the net operating cost of the year, it shows that the Conservation Commission in that year entailed a net cost to the State of New York of only \$423,684.88. If we deduct the entire net cost of the Reservation, which was \$160,659.62, we find that the net cost of all other Divisions was \$348,169.25, which was \$32,386.86 less than the net cost for 1915.)

June 30, 1918.....	\$964,752 37	\$431,166 37	\$533,586 00
--------------------	--------------	--------------	--------------

(The increase in net cost is attributable partly to a decrease in receipts, due entirely to war conditions, and partly to the steadily rising cost of all commodities and of personal service.)

June 30, 1919.....	\$1,254,551 81	\$563,606 00	\$690,945 81
--------------------	----------------	--------------	--------------

(The increased net cost in 1919 is due partly to the general rise in commodity prices and personal service. It is also largely due to an expenditure of \$148,776.96 on the new Washington bath house at Saratoga Springs. This is the finest bath house in this country and represents a permanent investment for many years to come. The net increase, exclusive of the bath house, is only \$8,582.85.

June 30, 1920.....	\$1,334,882 41	\$560,829 04	\$774,053 37
--------------------	----------------	--------------	--------------

(This increased net cost is due partly to increased expenses in forest fire fighting, due to a larger number of fires, and partly to the general rise in prices. It is also partly attributable to a loss of revenue from the Bottling Department of the Saratoga Reservation, which is now operated by a private corporation under a lease executed by the former Commissioners and sustained by the Court of Appeals.)

In order that the net cost in 1920 may be compared with that of 1915, it is necessary to deduct from the 1920 net cost the net cost of the Saratoga Reservation for that year, for the reason that in 1915 the Saratoga Reservation was not under the jurisdiction of this Commission. When this is done, it is found that the increase in annual net cost after six years, and with many functions added, is \$221,218.52. This is an average annual increase in tax burden for each year of the six of only \$36,869.75. Improvements, constructions, equipment, and increased efficiency in the performance of the Commission's functions have far exceeded this modest increase of tax burden.

Net Cost and Value Received. It is possible to analyze the financial transactions of the Commission for the last six years in another way, with most illuminating results. The total net cost of the Commission from 1915 to 1920, found by adding the figures of net cost, given above, was \$3,156,852.20. An analysis of disbursements for the same period, however, shows that \$389,125.32 was expended for construction, permanent equipment and land exclusive of Forest Preserve Fund purchases. These are all assets, the value of which still inheres in the State. If they are subtracted from the total net cost of \$3,156,852.20, we have \$2,767,726.88, which is an average annual net cost of \$461,287.81 after allowance has been made for cash receipts, constructions, and land purchases. It is the average amount made up each year by taxation for operating expense.

As an offset to this net cost, the State receives each year the product of the fish hatcheries and game farms, and trees from the State nurseries used in reforesting State land, all of which are conservatively worth not less than \$300,000. In fact, in the year just closed, they were worth far more, as is shown on page 62 of this report. There remains \$161,287.81 for the expenditure of which the Commission should show value. A mere list of the more important activities is sufficient to demonstrate that the people of the State receive full value many times over for every dollar raised by taxation for the operation of the Conservation Commission. The chief of these activities are:

Protection of wild life;
Administration of the shellfish grounds;
Protection against forest fires in an area larger than Massachusetts, Rhode Island, and Connecticut;
Planting of trees on thousands of acres of State land;
Administration of the State's fifty million dollar Forest Preserve property;
Fighting white pine blister rust throughout the entire State;
Survey of the power producing streams;
Administration of the laws governing potable water supply and sewage disposal;
Supervision over the safety of docks and dams;
Administration of the State Reservation at Saratoga Springs;
And many other minor activities.

On page 88 of this report it will be seen that in the single year of 1918 licensed hunters took game birds and animals conservatively worth \$3,239,277. The total net cost of the Conservation Commission, including every department and every expense for construction, permanent equipment and land, exclusive of Forest Preserve Fund purchases, from 1915 to 1920, was \$3,156,852.20. This is the total amount which had to be made up by taxation for all conservation purposes during that period. A comparison of these figures thus shows that:

In the single year of 1918 licensed hunters, who constitute only a small fraction of the people of the State directly benefited by conservation, took game worth more than \$82,000 in excess of the entire net cost of the Conservation Commission for six years.

A NATIONAL FOREST PROGRAM

In an address before the American Lumber Congress in Chicago on April 16, 1919, Colonel Henry S. Graves, Chief of the Forest Service, proposed a nation-wide lumber and forest policy, to check the waste of forest resources, and to provide for the lumber needs of the future. Some of the more salient features of the warning of the timber shortage issued by Colonel Graves were contained in the last Annual Report of this Commission to the Legislature, and formed the basis for a plan for extending to all forest and woodlot areas in New York State the constructive practices of forest pro-

tection and reforestation, which have heretofore been confined chiefly to the Adirondack and Catskill regions.

The great need of a constructive forest program not only for New York State, but for the entire nation, is apparent upon even a most superficial survey of the forest situation. Professor Ralph S. Hosmer of the Department of Forestry of Cornell University has recently outlined the facts as follows:

"You all know that approximately four-fifths of the merchantable forests of the country are privately owned; that we are cutting at four times the rate the forests are being reproduced; and that the time will soon be upon us when the lumber industry will be centered in the last remaining forest region of the United States, the Pacific Northwest. When the original forests are gone, we must depend on second growth. No adequate provision is being made now even for the proper protection of such future forests, let alone any effective measures of increasing their productiveness. The advocates of a National timberland policy seek a remedy before it is too late.

"Foreign sources of supply are not to be depended on. What other countries might export to us could be but a temporary measure of relief. North America has got to supply her own needs for wood by growing her own forests. And these forests, on which we must in the future depend, will be grown on what is now privately owned land. The American people must have wood. It is indispensable to our civilization. The crux of the whole matter is, will the owners of the great areas of land that are only valuable because they can grow trees, themselves meet the needs of the future, or must the public be forced to take over these areas and make the production of wood a strictly public affair? We have come to a parting of the ways. A decision will soon be reached. It, therefore, behooves every forest land owner to know the facts and decide whether he will make provision to keep his land continually productive, or whether he prefers to let the people, through their government, take over the management of his forest lands."

Since the initiation of the discussion of a nation-wide forest program by Colonel Graves nearly two years ago, many forest policies have been advocated by different interests. The first tendency of those most directly concerned in timber production

was to feel that their rights were to be encroached upon, and they either advocated forest policies at variance with national welfare, or combatted any constructive proposals that were advanced. In the course of nearly two years' discussion, however, a saner view has at last come to prevail. The great wood-using industries, which are indispensable to our comfort and civilization, have come to appreciate as never before that their very future is bound up with forest protection and reproduction. As a result, a national forestry program has been evolved, and a bill to embody it has been introduced into Congress by Congressman Bertrand H. Snell of New York, which is known as H. R. 15327. It embodies the recommendations of Col. W. B. Greeley, now chief of the U. S. Forest Service, and is the result of the joint work of the U. S. Forest Service, the American Forestry Association, the Western Forestry and Conservation Association, the Society for Protection of New Hampshire Forests, the American Newspapers' Publishers' Association, the American Paper and Pulp Association, the Association of Wood-Using Industries, the National Lumber Manufacturers' Association, and the National Wholesale Lumber Dealers' Association.

It is believed by the Conservation Commission that if this bill becomes a law, it will place the country a long step forward on the road to forest protection and reproduction. In all of its essential features it conforms to the principles of forest policy which have been so long and successfully operative in New York State. New York has found its own forest policy to be worth while, and since approximately two-thirds of the annual lumber needs of this State must be met by importation, we are vitally interested in the adoption of more effective forest policies in other states.

The chief provisions of the Snell forestry bill are outlined in the following paragraphs:

1. *An appropriation of two million dollars yearly for five years is made for forest protection, and for a survey of forest resources and timber requirements of the nation.* The money for forest protection is to be spent in cooperation with those states which institute forestry practices approved by the Federal government, the Federal government to pay an amount not in excess of that paid by the states. This system is similar to that now in force

under the Weeks Law, under which New York State now receives substantial Federal assistance in fire protection.

2. *An appropriation of one million dollars for five years is made for forest research and investigations in wood utilization, including the study of forest taxation.* One of the most effective methods of checking forest depletion is to make more effective use of the forests, and particularly to devise methods for using less valuable species in ways never before found possible. For instance, if hardwoods can be used for certain kinds of paper making, the faster growing softwoods will be relieved of a large part of their drain, and vast areas of land which now contain nothing but hardwood can be profitably cleared of these trees, and the land devoted to softwood production. There are already promises of success in this direction. Work of this sort should be very much intensified with Federal assistance.

Several bills have recently been introduced in the New York State Legislature to encourage the holding of timber until it has reached its maximum growth, by a change in the system of taxation. Until such a change is made, we must expect that the cutting of immature trees for the purpose of avoiding annual taxation burdens will continue.

3. *One million dollars yearly is appropriated for reforesting denuded lands in national forests.* New York State leads all other states in reforestation, and should be a consistent advocate of extensive reforestation in other parts of the country, from which a large portion of this state's timber supply must always come.

4. *An appropriation of ten million dollars for five years is made for acquiring additional land for national forests.* The method of acquisition is defined, and authorization is given for the exchange of certain types of land and timber, for the purpose of consolidating Federal holdings in the most important forest regions. New York State has found it necessary to increase the area of the Forest Preserve in order to prevent forest devastation. This need exists to an even greater extent in other states, where the efficient administration of the Forest Service offers the only hope of a suitable forest policy.

Because of the great importance of this subject to New York State, which is one of the most important wood-using States in

the country, and because the forest program embodied in the Snell bill is entirely co-operative and does not impose restrictive and burdensome control upon the States, but rather extends Federal assistance, the Commission suggests to the Legislature the advisability of a concurrent resolution, which will record this State in favor of a strong and rational Federal forest policy, and which will instruct its representatives in Congress to use their best efforts to secure the adoption of such a policy.

EDUCATIONAL WORK

One of the outstanding features of the Conservation Commission's educational work during the year has been the number of public lectures that have been given throughout the State, a number which was far larger than in any previous year.

Starting in 1915 with hardly a lantern slide and not a single foot of motion picture film, the Commission has gradually built up material for visual education in all phases of conservation, which to-day is probably not equalled elsewhere in the country. The Commission's free lectures need no pushing or advertising, but, on the contrary, the requests for them have now become so numerous that it is impossible to accept all. The records show that during the year 1920, 129 conservation lectures, practically all illustrated, were given by various members of the Commission's force. This is an average of over two a week, winter and summer, although, as a matter of fact, the demand for lectures is much more active during the winter season, when speakers are sometimes in the field for a week at a time.

A new departure made during the past summer, which may lead in future years to increased activity during the "dull" lecture months, was a series of illustrated conservation talks in boys' summer camps. The result of these talks was most gratifying from a conservation standpoint, as the guiding of the young along true conservation lines is a fundamental principle, and the boys in camp, surrounded as they were by the works of nature, were found to be in an especially receptive frame of mind.

Records which are kept of the attendance at each of the Commission's lectures show that at the 129 lectures which were given, 32,790 people were reached, or an average of 254 at each lecture.

This includes some audiences that filled city theatres to their capacity, as well as small gatherings of farmers who have assembled at some rural center to hear a forester from the Commission explain the proper care of wood-lots or outline a method of co-operation in the reforestation of non-agricultural land.

In addition to its regular lecture program, the Conservation Commission co-operated with the Federal government in the lecture work relative to white pine blister rust referred to in



REVERSE SIDE OF THE CONSERVATIONIST CREED WITH FAC SIMILE OF THE BUTTON.

the report of the Division of Lands and Forests. At each of the thirty lectures delivered in that educational campaign there was shown, in addition to pictures of the white pine blister rust, a reel depicting general conservation subjects selected from the Commission's films.

Opportunity for the asking of questions is an important feature of all the Commission's lectures and leads sometimes to lively and enlightening discussions. During the past year, for example, the Commission has attempted to foster increased co-operation between the sportsman and the farmer, and to encourage by free expression of opinion an airing of their differences, together with the best means for their rectification. Lectures were often followed by correspondence from persons who have heard the speaker, with the result that hundreds have been brought into personal touch with the Commission and have adopted a changed attitude as a result of this branch of the Commission's educational work.

In order to meet the constantly increasing requests for an opportunity to see the Commission's motion picture films, and also for the purpose of sending them outside of the State to carry the message of conservation where it will do as much good as at home, the Commission has during the past year entered into an arrangement with the Educational Films Corporation of America to distribute its pictures throughout the United States and in some parts of Europe. A business contract has been entered into by which the State will receive 50 per cent from the gross proceeds.

The first picture that has been prepared and put into general circulation by the Educational Films Corporation contains some of the Commission's best life studies of various wild creatures, and is entitled "Wilderness Friends." The work of the State's game farms, fish hatcheries and tree nurseries, the water power resources of the State, and the picturesque scenery of the State parks under the jurisdiction of the Conservation Commission will also be shown in the same series. Still another picture, which is about to be released, contains a wild life drama in which a violator of the Game Law is pursued and captured by one of the State game protectors.

The usual publication work of the Commission has continued throughout 1920 along much the same lines as in previous years. News items, magazine articles, and contributions to Sunday newspapers have been issued on an average of once in every five days throughout the year. These, according to clippings received and kept on file in folders, have been published and republished 2,534 times.

The Commission's illustrated magazine, THE CONSERVATIONIST, has been issued regularly each month. Every number contains some half dozen articles which are often reprinted in newspapers and magazines, thus extending the influence of conservation beyond the circle of those who read the magazine. The list of subscribers has had an encouraging growth during the year, remittances for new subscriptions being received almost daily, without the impetus of any special "drive." As an interesting example of the wide field which THE CONSERVATIONIST reaches, a practicing physician in London writes: "I

keep *THE CONSERVATIONIST* on my waiting-room table and I often find patients perusing it, so that already the publication has done good on this side of the ocean." A New Yorker who receives the magazine states that after he has read it through he sends it to the Forestry College in Prague, Czechoslovakia.

For the free publications of the Commission there has been an unprecedented demand during 1920. Of the recreation circulars alone approximately 100,000 were distributed in the course of the year. The first edition of the 1919 annual report was quickly exhausted.

In December, 1919, the Conservation Commission prepared a simple creed which a person who wishes to align himself definitely with the Conservation movement may sign, and receive free of charge from the Commission a pin, or emblem, distinguishing him as a Conservationist of the Empire State. This enrollment of active conservationists has during the past year been brought to the attention of the public chiefly through enclosures in mail matter sent out by the Commission, and through reference to the emblem made at lectures. In addition, framed examples of the creed and emblem have been displayed at every mountain observation station, where they could be seen by the many vacationists who visited these stations during the summer. The creed follows:

I BELIEVE

THAT "God has lent us the earth for our life. It is a great entail. It belongs as much to those who are to come after us as to us, and we have no right, by anything we do or neglect, to involve them in any unnecessary penalties, or to deprive them of the benefit which was in our power to bequeath."—Ruskin.

That, in a great democracy of free people, the protection of wild life and the preservation of all other natural resources, which underlie national prosperity and happiness, must depend finally, as does the stability of the government itself, upon the support and willing service of every citizen.

I therefore declare my adherence to these principles, and enroll myself as an active Conservationist of the Empire State.

The response has been immediate and in extent has far exceeded the anticipations of the Commission. The first order of 10,000 emblems has already been distributed, and start has been made

upon a second order of 10,000. Among the many persons who are now wearing the little gold button are men, women, boys and girls of all classes. Distribution of the emblem among young people, especially where this can be done under the direction of an older mind, has been welcomed. Organizations of Boy Scouts, for instance, have manifested a great interest in enrollment, often as a result of scoutmasters having brought the matter before their troops and explained to the boys the true meaning of the movement. In other cases distribution has been made by school teachers, who have used reasonable judgment as to those who should receive the emblem. One teacher in a large high school returned 112 creeds which had been signed by "the older students of biology."

More than one "Conservation Club" has been formed by wearers of the emblem. For example, a letter from Kingston reads: "Our Conservation Club is well under way. These are our main rules: 'Obey the Game Laws; Prevent Forest Fires; Look Before You Shoot.' We have many other subordinate ones. The boys have already taken much interest in the work and are building and putting out bird houses. The cards were signed so fast that a good many fellows were left out. I wish you would send twenty-five more cards. I can have this number signed easily."

A boy who applied for an emblem after having heard one of the Commission's lectures at a summer camp wrote: "Wherever I have been I have done as much as I could to prevent the killing of birds, peeling of birch bark, etc. Sometimes I have been asked what business it was of mine, and what was my authority. I thought it would be a good idea to wear one of the pins, that showed I ought to prove what it stands for."

Among adults the emblems have received wide distribution through sportsmen's clubs, forestry organizations, etc., as well as by applications from individuals. In consequence, one may nowadays frequently meet those who are wearing this new badge of the outdoor brotherhood. The far-reaching interest aroused by the establishment of these emblems is evidenced by the very large number of letters which have been written to the Commission on this subject. In several instances contributions of money have

been offered, but these have not been accepted, as the expenses of this project have been met from the beginning by a friend of conservation.

One man wrote that he and a companion had worked hard for over half an hour putting out a forest fire which they discovered blazing on the side of Peekamoose mountain. His letter ends: "I am a Conservationist, and wear the Conservationist Button for the State of New York."

REGISTRATION OF GUIDES

In order to make the Forest Preserve, which is the playground of the people of the State, more accessible to a greater number of people, and to conserve for the future as well as the present its natural beauties of mountains and lakes and the wild life which inhabits the forests and streams, it is necessary that the Commission, the residents of the Forest Preserve counties, and the vacationists work together in harmony toward the one end.

With this purpose in mind, the Legislature of 1919 passed a law giving the Conservation Commission authority to receive applications and to establish a Register of competent guides throughout the Forest Preserve counties of the State. The Commission believes that this registration of guides, which has now been in force for a little over a year, has been entirely successful, and has secured the interest and approval of the competent guides in the woods. While not all of the guides are yet registered, applications are being constantly received, and it is felt that the Register of Guides will before long contain the names of practically all of the foremost men in this field. The advantage to vacationists of such a list is obvious. Even in this short period of time, the cooperation of the guides has had a great effect in preventing forest devastation by carelessly set fires, and has stirred up a greater zest and enthusiasm for a vacational use of the Forest Preserve playground among people who can now be certain of securing the services of efficient guides.

The practical administration of the guides' registration has been vested in a committee of three guides in each district. Meetings of the various guides' committees were held in the spring of

1920, and as a result many more applications were accepted. There are at present 314 men registered as guides, and it is excepted that most of these registrations will be renewed for 1921, as well as many more added. A number of applications were received from men engaged in other lines of work, desiring to be registered as guides as a proof of their prowess as woodsmen, but the Commission has of course rejected these, as the main object of the law is to provide a list of competent guides who are available for employment by camping, hunting, and fishing parties.

The second edition of the Register of Guides was published on July 1, 1920, in a style uniform with that of the Recreation circulars. Among the great volume of requests for copies of the recreation circulars were many asking for the Register of Guides. There were 6,200 copies in all sent out this year, and through this publicity the names of registered guides have been scattered broadcast through the State, with a corresponding increase in requests for their services. The Commission feels that the annual publication of this official list will do much toward keeping the business of guiding in the State of New York in the respected position which it has held for such a long period of time.

POLLUTION OF WATERS

Water as a Natural Resource. Water is a vital resource. Land without water is desert. In its broadest and narrowest sense, life is absolutely dependent upon water. Water is necessary for every human activity. It is the foundation of agriculture, commerce, manufacture, fisheries and recreational opportunity.

Water Resources of New York State. New York State is most richly endowed with this great resource. The Great Lakes on the northern boundary, the finger lakes, Lake George, Lake Champlain and smaller bodies of water, the great river and canal systems, and the tidal waters about New York and Long Island, furnish the greatest example of water resources to be found in an area of equal size. Upon the wonderful harbor facilities of New York City depends the greatness of this metropolis. To obtain a suitable drinking water supply, this city has built tremendous

engineering works. The Hudson river and Barge canal, together with the Great Lakes, connect the east and west by a water artery of commerce. The power possibilities of Niagara Falls are rivaled only by its scenic beauty. Manufacturers throughout the State are located so as to avail themselves of the use of the abundant waters. The fisheries, while small in financial comparison to manufactures, are great intrinsically as a source of food. The waters of the State preserves and parks make them the beautiful and healthful playground of the people, and the medicinal waters of Saratoga heal the sick.

Water Regulation. The economic value of water, because of the use to which it can be applied, has caused various boards and commissions to be created for the regulation of this public resource. Improvement of navigation, development of hydro-electric power, irrigation, drainage and flood control are all under the jurisdiction of appropriate public bodies. The value of water for these purposes depends upon the quantity of water which can, by proper control through engineering knowledge, be utilized to advantage.

Value Also Depends Upon Quality. There is also a value adherent in water because of its quality, which makes it adaptable for various uses. Mr. F. H. Newell, in a book called "Water Resources — Present and Future Uses," makes the following statement: "In considering the uses of water and consequently the expenditures which may be made in conservation by storage, we may divide these uses into five classes. First, support of life; second, production of food; third, carrying away wastes; fourth, manufacturing, including water power; fifth, navigation." Biological and chemical problems, as well as engineering, are important factors in the first four classes, and governmental bodies have been appointed to prevent, as far as possible, injury to the value of water which depends upon its quality.

Quality Control Investigation. Realizing the deleterious effects of contaminating substances, which accumulate with the growth of population, and attending activity, the Legislature passed, in 1918, a bill to provide for the study of these effects, and the means for preventing injuries which they produce on fish life. Because the life within the waters is so dependent upon

its quality; and because the fishing values of the streams are so widely distributed throughout the State; and because almost all polluting substances in some way affect fish life in the waters, the studies of these effects, and the means of preventing the same,

FACTORS IN SUCCESSFUL FACTORY LOCATION

THE LABOR MARKET (Large Cities)

CHEAP MOTIVE POWER (Coal, water, oil, natural gas)

TRANSPORTATION (Water, rail)

WATER SUPPLY (Quantity, quality)

PROPER DRAINAGE

MEANS OF WASTE DISPOSAL

CLIMATIC CONDITIONS

**SUPPLY OF FOOD AND OTHER NECESSITIES
OF LIFE**

PROVISION FOR EXPANSION

PROXIMITY TO MARKETS

INDUSTRIAL CHEMISTRY

COLUMBIA UNIVERSITY

CHART PREPARED BY THE DEPARTMENT OF INDUSTRIAL CHEMISTRY OF COLUMBIA UNIVERSITY, SHOWING THE IMPORTANCE OF WATER SUPPLY AND MEANS OF WASTE DISPOSAL IN FACTORY LOCATION, THE QUALITY OF WATER BEING COORDINATED WITH ITS QUANTITY.

are intimately bound up with almost every other effect which results from pollution of waters. A study of the effect upon fish life, therefore, is a step in the direction of bringing together the work of various agencies interested in the conservation of the quality of water. Any system of prevention is one of control of quality by regulation of wastes.

Regulation Versus Prohibition. Prohibition of wastes is impossible and would be undesirable. Such action would stifle the interests for which the quality of waters is of value. Standards demanded for New York City water supply would not apply to the harbor, which is more valuable for shipping and to carry away the wastes of the city. It is, therefore, essential to classify the natural waters according to the use for which they are adaptable, and determine standards for the control of the quality of each class, for regulating the disposal of wastes.

Seven distinct steps have been made in the investigation of the effects of polluting substances on fish life and means of preventing same.

I. General Survey of the Water Resources of New York State and the Effects Which Pollution Has Had Upon Water Life

A preliminary survey of the general effects of wastes upon the aquatic life of the streams of the State has already been reported by the Commission. Professor Henry B. Ward of the University of Illinois investigated the present biological conditions of the streams during the summer of 1918. His report, entitled "Stream Pollution in New York State," shows clearly that the life in the streams is being rapidly changed, due to the effects of pollution. The report has created a great interest in conditions, and has been widely distributed, not only in New York State, but requests have been received from many of the other states. This expert testimony, from such an authority on biology, should convince all interested in conservation that the time has arrived in this country when measures, long practiced in older and more developed countries, should be adopted.

II. History and General Study of Investigations Into Specific Effects of Wastes and Methods of Prevention

The second step has been to gather in the offices of the Commission all available information on the subject. A vast amount of scientific work has already been done which has been reported in numberless journals and reports. Studies on waste disposal and the effects of wastes upon the natural waters have been made by the U. S. Geological Survey, the U. S. Army Corps of Engineers, U. S. Public Health Service, U. S. Bureau of Fisheries, U. S. Department of Agriculture, State Boards of Health, State Commissions on the disposal of trade wastes, Metropolitan Sewerage Boards, commissions of purity of water, sanitary, agricultural, commercial and other experimental stations and educational institutions.

The reports and activities of these different agencies are of great value, and the Conservation Commission would be only doing its bit to assist and add to this knowledge. It is believed, however, that a much greater possibility is open to the Commission in the nature of its organization and functions. By striving to co-ordinate and digest the results of the different agencies in water quality conservation, and by uniting the interests concerned in the general problem, it will be possible to accomplish the greatest results at the present time. The fact that so much work has been accomplished, with so little general appreciation by the public, whose interest would make much desirable action possible at the present time, shows how much opportunity the Commission has for valuable work.

A study has been made of pollution laws in other states and countries, together with governmental organization for the prevention of injury. Here again it is evident that while much investigation has been done, comparatively little preventive action has yet resulted. The Conservation Commission as an administrative body can by proper utilization of this effort, and by working in co-operation with various interested parties, secure a more effective administration of the laws regarding the pollution of waters.

The need of such an intermediary body to establish unity of effort is most clearly recognized in the final report of the Royal

Commission on Sewage Disposal of Great Britain. After seventeen years of careful study, this board of experts were more fully convinced of the decision at which they early arrived, that the only effective method of prevention would be to create a Central Authority, charged with duty of so uniting all common endeavor, as through a clearing house of information and action. The State of Rhode Island, immediately threatened with the destruction of Narragansett Bay, has tried to accomplish this purpose by the creation of a Purity of Waters Board, with similar functions. In New York State, the logical place for carrying out such functions, of conservation of the quality of the natural waters, is in the Conservation Commission.

III. Statement of Ideals of Conservation of the Quality of Water

Having surveyed the field, present and historical, the third step was to formulate a statement of the need, nature and purpose of water quality conservation, and the general methods which promise to be effective in its attainment. A paper entitled "The Conservation of the Quality of Water in New York State as a Natural Resource," was published in *Science*, which set forth the rational ideals which could be hoped for and the reasonable means of accomplishment.

The object of the paper was to create a fuller understanding among interested persons as a guide toward harmony of effort and to dispel many of the illusions which obscure the subject and hinder progress.

IV. Administrative Program for Progress Under the Jurisdiction of the Conservation Commission

The conservation law does not provide for any general treatment of the problem as outlined above. Since, however, its functions require administrative action upon several subdivisions of the main problem, it has been found desirable to prepare an administrative program for guidance in these actions. The fourth step, therefore, has been to develop such an administrative program, which was briefly reported to the last Legislature. It has been found very useful in co-ordinating the work within the Com-

mission, and also in harmonizing it with the work of other governmental bodies.

Many of the problems connected with the prevention of pollution are rather administrative in nature than scientific. The point of view hitherto has been to study means of disposal of wastes rather than to inquire into administrative measures for the exclusion of wastes. To prevent much of the injury, further knowledge is not necessary, for it merely is a problem of excluding deleterious substances from the stream. On the other hand, prevention of injury is not always accomplished by prosecution, because means of disposal are not, in many cases, at present, available. In such cases it is more desirable to induce industries to study their wastes than to bring action. When these industries are convinced that the Conservation Commission is guided by a rational plan of procedure, they are more inclined to take the necessary action. The Milk Conference Board of New York City being convinced by this program that the Commission desired to take a reasonable position, appropriated the sum of \$10,000 to Cornell University to study methods for the disposal of dairy wastes. It is believed that such action will accomplish more in preventing the effect of pollution than would a similar amount paid in fines.

Although the conservation law does not give the Commission discretionary power, it is believed that more constructive work has been accomplished than would otherwise have resulted without such a suggestive program. It should be possible to determine the best use of a body of water, and so determine the standards which should apply and the degree of treatment necessary to meet those requirements. By its influence upon the administrative efforts of the Commission in carrying out its work, the program has in many ways served to remedy this defect and increase the efficiency of work on pollution prevention.

V. Branches of Commission Active Under the Program

The Conservation Commission exercises many functions, important in any system of regulation of the discharge of wastes. The law requires from the Commission permits for all new sewer outlets. The Division of Waters must determine the necessary

degree of treatment before such applications are approved. The engineering staff of this Division has accumulated exhaustive records and data on the water resources of the State. Information upon stream flow, maps and other engineering data, showing the nature of the water courses, are just as necessary in quality control as in other problems of water conservation. The Division of Waters is thus peculiarly equipped to act upon questions under the class of treatment wastes.

The Division of Fish and Game is charged with the enforcement of pollution laws. For this purpose there are available an effective force of protectors continually patrolling the streams. It is possible for them to make the necessary inspections and see that regulations are lived up to, and trace down any violations of the law. Although the law is rigid and does not admit of discretionary power, it is possible under the program to adopt a policy aimed at the intelligent application of the law by which constructive work on prevention may be developed. The Division of Fish and Game is, therefore, specially prepared to take positive and direct action upon all cases of prohibitive wastes.

The counsel to the Commission is prepared to advise and take action upon all legal questions involved.

At Saratoga Springs the Commission has a well equipped water laboratory where the chemist is prepared to make complete analyses.

The hatcheries in the State give an exceptional opportunity for studying the effects of pollution on fish life.

With the law creating a technical staff for the investigation of pollution problems, it is possible to bring together the necessary information for reasonable action. The subject is so broad and so dependent upon intricate scientific relations that any action without due regard for biological, chemical and economic factors is bound to be arbitrary and ineffective.

One of the principal forces in furthering any comprehensive program, is the education of the people's interest in the water resources, as well as the responsibility of the industries for the injury due to their wastes, and here the Publication Bureau can render assistance.

The Conservation Commission thus has the essential organization to act upon an effective program for the control of the quality of waters by the regulation of wastes.

VI. Development of Organization for Action on Program

It is obvious from paragraph V that the Conservation Commission already has many powers and many agencies for taking action upon a comprehensive program. These various functions, however, are performed in different divisions of the Commission and there is no provision under the law for their co-ordination. Only by the adoption of a general plan is it possible for the Commissioner, in guiding the activities of the Commission, to so direct the parts that the resultant policy will work toward unity.

The separation of pollution laws and regulating bodies even within the Commission is the result of the manner in which the problem of quality conservation has developed, and the discussion of the necessity of co-operation between various government agencies working together upon the common problem applies even more to the unity of effort within a single Commission. The problem is sufficiently large and united to demand individual attention, instead of trusting to chance that the activities subordinate to other duties of isolated parts develop unguided into a general movement. A single party should be responsible for the classification of records and actions so as to make all information available and lead to the efficient development of the program. With the purpose of methodically handling the routine the following system has been outlined:

1. SEWERAGE APPLICATIONS:

The routine method of handling *sewerage applications* is established.

2. COMPLAINTS:

Complaints of the discharge of injurious wastes should be received by the Commissioner. They should be acknowledged, recorded, and classified for proper action.

(A) *Prospective Pollution Cases.* Where the information received with *complaint* is not sufficient to classify it or it is impossible to proceed against the case immediately, the *complaint* will be acknowledged; the position of the Commission outlined; and the information blank forwarded to obtain further information as regards the complaint.

3. CASES OF POLLUTION:

Where the complaint is not definite enough to be classified as a *case of pollution* it will be referred to the Division of Fish and Game for the protector to confirm the facts.

If the facts as determined by the protector are not sufficient to indicate that the Conservation Law is being violated, the case will be referred to the Division of Waters to report as to whether the condition and quantity of waste, the methods of treatment, and the condition and quantity of water, into which it is discharged determine it to be a *violation* and to determine the possibilities of adequate treatment of the wastes.

4. VIOLATIONS:

Where the report returned by the Division of Fish and Game confirms the introduction of the prohibitive waste into the water or report from the Division of Waters shows the waste not to be innocuous, the *case of pollution* becomes a *violation* of the Conservation Law. The violator will be notified to that effect and arrangements made to cease the introduction of prohibitive wastes; or to install treatment methods, where known and practicable; or to assume the responsibility of investigation as to methods to prevent the damage determined, where such knowledge is not already available. Upon acknowledgment of this condition by the violator, and agreement as to the steps that shall be taken, the *violation* will be referred to the Division of Fish and Game for the protector to observe that the agreement is fulfilled. Should the violator neglect to fulfill the agreement, or refuse to take any measures to prevent the damage, the *violation* is reported by the protector, and becomes a case for *prosecution*.

5. PROSECUTIONS:

Should it be necessary to prosecute in order to enforce the law, the *violation* will be referred to the Counsel. Biological and other investigations will be made to prepare a strong case for the action of the Counsel. The nature of these investigations will depend upon the scientific and legal aspects of the question as determined by the Counsel.

The provision for withholding prosecution until any violator has had reasonable opportunity to install treatment works, or carry out conscientious investigation, should be noted. While such discre-

tionary power does not exist in the law, it should be a part of a preventive system of control.

The advantages to be gained in a methodical administrative routine should be even greater in the more general phases of the program.

In conducting field surveys, biological investigations, experiments on fish culture and fish feeding, the planting of fish in natural waters and many other kinds of work, all of which depend upon the quality of the water, many relations exist requiring co-ordination of effort. The Commissioner should have at his disposal an office for working out such details.

The work upon pollution, to be consistent with the Commission, should carry with it authority to designate after appropriate means of determination, the permissible use of a water, together with standards governing the quality required for that use. The qualitative capacity of water, and the economic values due to that capacity are just as definite and measurable in scientific terms as the engineering determination of water power units. Each outlet discharging wastes may be considered to be withdrawing a certain number of quality units which should be accounted for to the State. By enforcing reasonable standards, based upon scientific and economic principles, the Commission is determining the amount of such value to which each is entitled.

VII. Suggestions for Legislative Action for Conserving the Quality of the Waters

Two great needs appear in this study of the effects of pollution, and means of remedying same.

First, it is apparent that many agencies and forces have long been and are now working to conserve the quality of water in which all persons are interested for various reasons. The principal objective of conservation should be to unite these forces and these interests to secure unity of effort. Within the Commission this same condition exists, and greater efficiency in its work, and in the development of a broader conservation program, can be secured by co-ordinating its efforts under one general plan. The will of the Legislature has shown marked progress by causing the subject to be investigated. The development of normal

action as a recognized part of the routine of the Commission, remains a desirable step.

Second, the lack of uniformity of effort among various agencies has led to much confusion. No common means of expressing the quality of the waters, and the condition necessary for various purposes, or the effects of waste upon that condition, are available. With a definite language in which the quality of water can be described in scientific terms, the haze and obscurity which hangs over the whole subject of pollution would be lifted. It is possible to define accurately in chemical terms (what might be called quality units) the necessary requirements of a water for any given use. It is just as easily possible to define the conditions, in the same terms, which a given effluent will cause in that water. It is further possible to a considerable, though limited, degree, to define, in those terms, the effect which treatment will have. The influence of a system or language in which these effects can be clearly stated, would accomplish a great deal toward a common understanding among different agencies, and thus secure much uniformity and efficiency of effort, without any change in organization. Further scientific investigation, together with a systematic digestion and interpretation of work already done, will be necessary for this purpose. It is recommended, therefore, that the Legislature continue the appropriation for the study of the effects of pollution, and further that it empower the Commission to determine a system of measurement and definition of quality in water, which effects its value, not only for the production of fish, but for other valuable uses, aimed at the more effective conservation of the quality of water as a natural resource.

The pollution laws, protecting fish life, are an example of the need of a rational system of expressing the condition of the water. These laws arbitrarily prohibit the introduction of any material into the waters, in quantities injurious to fish life, or the propagation of fish. All substances entering the water change it to some degree, and the temporary result is usually injurious in a large or small localized area. The total effect, however, may be to increase the fish life farther down the stream, because of the fertilizing power, for the production of fish food, of some of the

substances which temporarily injure the stream above. It is only by scientific methods that the changes in the quality of the water can be determined, and expressed so that the actual injury to the water as a natural resource can be determined. It is evident, therefore, that even in the intelligent and efficient enforcement of the law, scientific investigation will be necessary to work out some such method. For the reason above, the work upon investigation should be continued by the support of the Legislature.

Until methods are worked out whereby a clear description, in scientific terms, of the condition of the waters of New York State is available, it may be premature to consider the desirability of condensing the pollution laws under the jurisdiction of the Conservation Commission. Such a possibility should be kept in mind, however, so that any alteration in routine may be considered with a view to this possibility. Action under the pollution program as described above is a step in this direction, and already greater efficiency in the administration of the pollution laws has resulted.

While the time may not be at hand for a comprehensive revision of laws regulating the discharge of wastes, so as to control the quality of the waters, the following suggestions are included for consideration because they may help to explain the reasons for many of the recommendations that precede.

LAW FOR CONTROL OF QUALITY OF WATER BY REGULATING DISCHARGE OF WASTES:

1. It shall be the duty of the Commission to study and investigate the quality of waters of the State as a natural resource, so as to complete a comprehensive system for the entire State, for the conservation, scientific development and regulation of the use of the natural waters of the State, to secure to the people of the State the greatest benefit and value of the suitable quality of those waters.

2. The Commission shall have the authority to regulate the introduction of contaminating substances which may become detrimental to the quality of said waters, or impair the most beneficial use of the natural quality of the water.

3. The Commission shall obtain information as to methods of treatment of wastes, which may, by such treat-

ment, be properly disposed of in the waters of the State, and study the effects of, changes in, and ultimate disappearance of, such substances from the waters.

4. The Commission shall obtain information as to the value, uses and needs of water of suitable quality throughout the State, and settle standards of quality for different reaches of water in accordance with the best use of that water.

5. In the regulation of the quality of the waters the Commission shall formulate general standards to operate under all conditions not otherwise specified.

(a) All regulations and standards shall be published and, if within one month thereafter good and sufficient cause is not shown why they would not be suitable to any reach, they shall be accepted as in force.

(b) Where special conditions make general standards impracticable, special standards may be determined for different reaches of water according to the best use of that water by the State.

(c) One year after the establishment of special standards, or one year after the acceptance of the general standards, all parties exceeding the limits of the standards shall be deemed violators of these laws.

(d) Where it is impracticable, or would be unjust, to require of any party the attainment of any standard, that party must give notice to that effect and show just cause, in writing, within one month of the publication of the standard.

(e) In such case, at the end of each year thereafter, such party shall present to the Commission in writing, evidence that it has taken all reasonable measures to conform to the standards.

(f) Five years thereafter, those not acting within the limits prescribed by the standards shall be deemed violators of the law.

6. In securing the necessary information the Commission may appoint or obtain the testimony and assistance of persons expert in the subjects involved, and generally cooperate with others in the study and investigation of such problems as will yield the fullest information on the subject.

Report on Artificial Propagation of Shellfish

The relation of pollution of State waters to the decline of the oyster industry was discussed in the Ninth Annual Report of

the Conservation Commission and the report of the Supervisor of Marine Fisheries for 1920 confirms the predictions then made. The failure of the "set" in the last five years results in a shortage of planting oysters at the present time, with the inevitable conclusion that growers must give up more grounds. Furthermore, the "set" for the present year has been unsuccessful, and failure makes the assumption that the condition of the waters has been



THE FIRST SUCCESSFUL OYSTER HATCHERY

radically altered more certain. It is, therefore, evident that unless proper measures are taken, the oyster industry will continue to fail, and considering the magnitude of the shellfish industries, it is clearly evident that their decline constitutes the greatest single positive effect of pollution upon fish life and propagation.

Should the effect of the pollution of the waters upon the drifting larval oysters be the real cause, it may be questioned whether former methods of securing seed will ever be again developed. To regenerate the condition of the waters in the former setting regions of New York State sufficiently to obtain the "set" would require expenditures so vast as to be impractical. This is because a high standard of purity must be maintained in harbor areas where pollution is most intense. Of recent years the practice

has been to obtain seed oysters from Connecticut. Here also, pollution is intense, and in fact practically all favorable Northern setting areas have been ruined.

The establishment of fish hatcheries throughout the State has



THE AERATING SYSTEM AND CENTRIFUGAL APPARATUS
WHICH MADE ARTIFICIAL OYSTER PROPAGATION POS-
SIBLE.

to a very large degree offset the inroads which a developing civilization makes upon the productiveness of the natural waters. Similar commercial methods now seem possible with the shellfish industries. Experiments conducted to determine the effect of chemical wastes upon shellfish propagation lead to such remarkable success as to give definite promise that development along

these lines offers the most probable remedy for the serious condition.

Through the courtesy of the Blue Points Oyster Company of West Sayville, Long Island, it was possible to establish an improvised biological experiment station in their shucking house for the past summer. The U. S. Bureau of Fisheries, who have



OYSTER PROBLEMS REQUIRE DELICATE TECHNICAL METHODS FOR THEIR SOLUTION.

conducted studies at this plant for several seasons, very kindly offered to assist and co-operate in carrying out the work. Much of the apparatus used in the experiments was borrowed from the Federal Bureau and the Connecticut Shellfish Commission also loaned a machine.

Early in June the oysters in Great South Bay were found to be filling with spawn. On June 12th, spawn was successfully fertilized and the experiments were commenced. The first trial led to immediate success in keeping countless numbers of young oysters, developed from the artificially spawned and fertilized eggs, for a period of eleven to fourteen days. Five different batches were included in this experiment, and they increased in

size and changed in form. All were lost, however, through improper attention at a time when the biologist was obliged to be absent for a few days.

New batches were started on July 4th, 5th, 10th, 16th and 21st. These all continued progressively to the "setting" stage, and thus for the first time an oyster "set" was obtained artificially under controlled conditions, and when the progress of development could be observed from day to day. By "set" is meant the habit of young oysters, after a preliminary period as free swimmers, of sinking to the bottom and attaching themselves to shells and other hard objects. The time of development from hatching to "setting" was established by the experiment to be approximately a month. It may be somewhat less in open waters, but circumstantial evidence of varying conditions leads us to think it cannot be much abbreviated. Early investigators thought that the period was very short, and even those who had determined that it was a matter of weeks underestimated the interval that was actually found to elapse.

The far reaching significance of this success and the possibilities for which it opens the way can be seen in the fact that the "set" is the starting point of the commercial oyster industry; and the continuous and the unexplained failure of the oysterman to secure a satisfactory "set" of young oysters is the main cause of the declining yield of oysters in northern waters within recent years. Once "set," the oysterman is perfectly familiar with methods of handling the oysters to raise them for market; but, if the young oysters do not attach themselves to the shells which the oysterman deposits for that purpose, his business naturally fails. The work thus fills in the baffling gap between the previous studies of scientists and the practical knowledge of the oystermen.

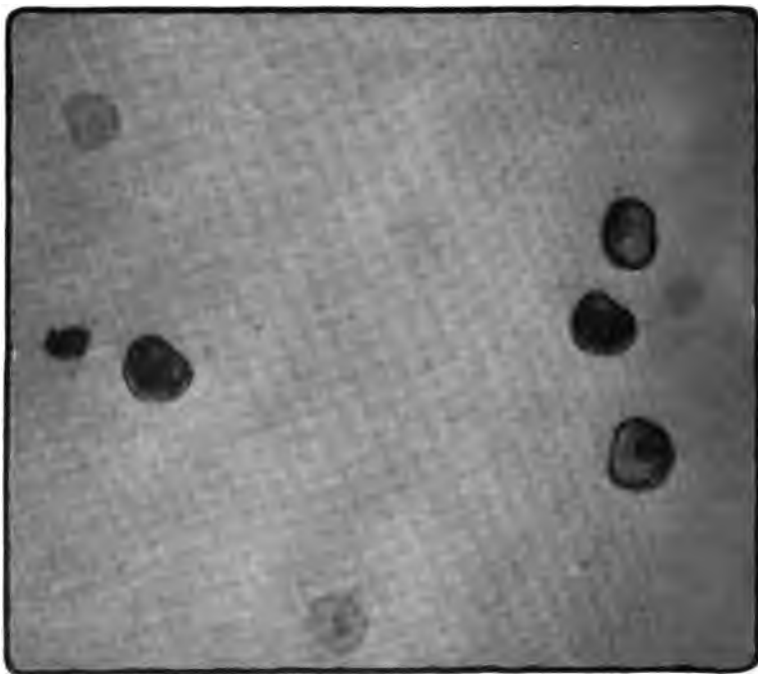
It is now not beyond the bounds of reasonable anticipation to look forward to the day when the crop of oysters may be vastly increased, either by stocking the beds with artificially secured "set," or by liberating at the proper time artificially developed young oysters which will make their own "set" in shell-planted waters, since a single oyster will discharge from 10,000,000 to 100,000,000 eggs each season.

The outfit consisted, during the latter part of the work, of a battery of nine glass bottles — having grown to these proportions from one bottle used at the beginning of the experiment. The bottles were five-gallon carboys ordinarily used to contain Sara-



THE WHITE SPOTS ARE OYSTERS SET FOR THE FIRST TIME ON THE
INSIDE OF THE BOTTLE.

toga waters. These were inverted and a tube inserted through the stopper, so that the air could be withdrawn from above the surface of the water. Another opening in the stopper contained a porous wooden plug which permitted the air to rise in a cloud of fine bubbles, and kept the water well aerated, giving it at the same time a gentle circulating motion in close imitation of the natural motion of the water in nature. All water was obtained

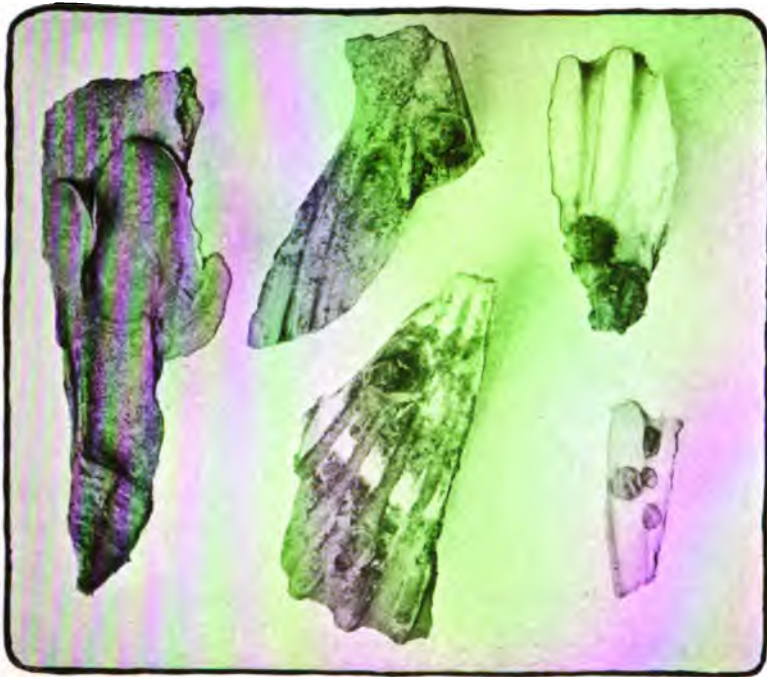


ARTIFICIALLY PROPAGATED OYSTERS, MAGNIFIED 100 TIMES.

from the bay in bottles. After the fresh water was prepared, the little oysters were concentrated by the centrifugal machine from the bottle that was ready to be changed and the transfer made.

A close watch was kept of the conditions of development by taking a small portion of the forms when they were concentrated and placing them under the microscope. It was evident at a glance whether the forms had developed naturally, whether they were active and in good condition, or whether many were dying. In this way their progress was observed at every stage, from the egg to the time when they became "set." Abundant material was thus offered for the study of the life history of shellfish, which has been very incomplete in the past.

In these experiments probably a million young oysters reached the stage when they began to seek their own food. The first change of water was then effected and was continued at two day intervals. There were naturally accumulative losses as a result of handling



ARTIFICIALLY PROPAGATED OYSTERS SET UPON BITS OF SHELL.

and observation. However, a uniformly high percentage of development was secured for about two weeks. From that time on it is believed that crowding tended to kill off or stunt the weaker forms. Some at this period began to forge ahead and develop more rapidly. Over a thousand reached the setting stage, and attached themselves not only to shells which were placed in the bottles for that purpose, but even to the glass sides of the bottles themselves. It was impossible to continue the growth of all the oysters, but some of the shells planted outside, showed typical development, and demonstrated that artificially developed spawn was fully as thrifty as the natural stock.

In conjunction with the U. S. Bureau of Fisheries the opportunity was taken during the investigation to test the effects of certain trade wastes upon the delicate young oyster forms, in order to determine whether the presence of chemical substances and other contaminating wastes in the setting areas of Connecticut and New York have been sufficient to explain the failure of the

"set." The quantity of such pollution necessary to injure the forms was determined and the basis laid for the intelligent regulation of waste matter in its effect upon the oyster industry.

Data is now at hand for proper design and technical routine required for the artificial development of young oysters. The experiment has worked perfectly on a laboratory scale, and on a larger scale the efficiency should be greatly improved — just as a properly equipped fish hatchery is more efficient than an emergency apparatus to which water must be carried from a well in buckets. There is every reason to believe that the method can be practically applied on any scale desired, and that it would work equally well for clams and other shellfish, such as scallops, which multiply in practically the same manner as oysters.

Having thus successfully propagated oysters on a laboratory scale, the next step will be to carry out a small scale commercial demonstration. By establishing a biological station on Long Island, in which the practical problems concerned in handling the "set" can be worked out, it is believed that in one year results will be obtained sufficiently convincing to interest oystermen to install larger plants on a commercial scale. Being a problem of a whole food producing industry, it seems reasonable that the State bear the expense for proving the practicability of the method. As the owner of thousands of acres of ground, which each year are becoming less and less valuable, with a consequent reduction of the revenue therefrom, the State can well afford a considerable outlay which promises to save an industry which is such a direct source of revenue.

Such a selfish official argument is by far the smallest reason why the State should interest itself in the welfare of a large food producing industry. The loss in taxes and rentals is but a small proportion of the indirect loss to the State through the decline of the industry, or the more important loss to the people of the most important water crop.

It is, therefore, recommended that the Legislature authorize the Commission to establish on Long Island a biological station for the purpose of developing a successful method for the artificial propagation of shellfish.

Shellfish Purification

The pollution of New York State waters in which shellfish are grown has vexed the authorities for many years. New growing areas are continually coming under suspicion because of the increasing volume of wastes. A satisfactory solution of the problem is desirable both in the interests of public health and the oyster industry. While most of the oysters produced in State waters are unquestionably clean, the effect of continual dispute over the remainder is to destroy the confidence that the people have in oysters, and thus depress the whole industry. It would be far better for the industry and the public, if doubtful areas were condemned at once, but this would make a great hardship upon the owners of these beds. Furthermore, the grounds leased by the State are very largely in the areas open to suspicion and such action would immediately cause a shrinkage in revenue. This is particularly true of Raritan Bay, much of which hitherto has been unrestricted but is being constantly threatened with new sources of pollution. The opening of the Passaic Valley sewer near the mouth of New York Harbor, whereby three hundred million gallons of sewage will be discharged into the waters of New York Bay, brings the question to an issue which must be decided. Recent rulings upon Jamaica Bay have already convinced oyster growers of the condition which threatens them, and they have been anxious to develop any measures which may be possible to remedy such effects of pollution upon fish life. Faced each year with the responsibility of issuing sanitary certificates for these oyster grounds the Commission must consider the subject, in order that it may take steps in the interest of the industry, and adopt a policy which can consistently be followed with due regard for the demands of public health.

At a hearing of oyster growers before the Commissioner of Health in New York City, held on March 1, 1920, a paper, entitled "The Purification of Oysters as a Conservation Measure," was read. The growers elected a committee to request assistance of the Conservation Commission in developing a method whereby shellfish can be so purified that a certificate of the product can be given, as provided for under Section 313 of the Conservation Law.

The committee represented the growers of Jamaica Bay and Raritan Bay.

It was agreed that the Conservation Commission would offer the oystermen the technical services of the Commission in carrying out commercial experiments on the purification of oysters by a method reported by the U. S. Public Health Service in July, 1916, and in operation for the years 1917, 1918 and 1919, at



THE MARKET OYSTER IS SHIFTED SEVERAL TIMES DURING CULTIVATION.

Conway, Wales, reported by the Board of Agriculture and Fisheries of Great Britain.

Following this meeting an endeavor was made during the months of April and May to bring about an arrangement for the demonstration and Dr. Payne B. Parsons of the Federal Department of Agriculture offered to co-operate in making the necessary laboratory examinations. The oystermen were actively engaged in obtaining their seed oysters for the season and so the experiments were postponed until August. Meanwhile, Dr. Parsons had arranged with the oystermen to provide the necessary equipment and also for co-operation with the U. S. Public Health

Service in conducting the work. Commissioner Copeland also arranged for the Department of Health of New York City to collect samples for approval of the product provided it met the required standards.

Experiments were commenced early in August at Great Kills, S. I., which continued for nearly two months. The growers provided tight floats and other equipment needed in the work and placed the oysters to be purified under the supervision of the representative of the Commission. The U. S. Department of Agriculture and the U. S. Public Health Service took initial and final samples of the product and assisted in the technical work. The New York City Department of Health obtained samples, and through their courtesy the oysters meeting approved standards were permitted for sale. It is thus evident that the experiments were on a miniature commercial scale, and that the demonstration accounted for all the practical factors involved in the adoption of the method on a larger commercial scale.

The demonstration succeeded from the beginning. Without all the refinements of a plant designed for the purpose, it was found practical to remove undesirable organisms to any necessary degree. Besides the reduction in bacterial content, a real internal cleansing was accomplished, making for an improved condition for the market, and for shipment. The shells were free from dirt and in every way the oysters were rendered more attractive as a food.

After a few weeks of successful operation, in which time the practical details of a smooth system were worked out, and a sufficient number of samples had proved the working efficiency under the conditions of the experiments, an inspection trip was arranged by the Commissioner for the purpose of explaining the principles and means of operating, and inquire into any factors in which the demonstration might not be considered complete.

Representatives of the U. S. Public Health Service, the U. S. Bureau of Chemistry, the New York State Department of Health and the Department of Health of New York City met the Conservation Commissioner September 14, 1920, on the Commission boat "Rednav" at New York City. Before reaching Great Kills

a general discussion of the problem of shellfish purification brought about agreement of the necessity of some means for removing suspicion from shellfish grown in restricted areas. The scientific principles underlying the method demonstrated were accepted as sound and no objection was made to any step in the process.

Upon arrival at Great Kills the actual demonstration of the details was carried out in the presence of the representatives and the purpose of each step explained. Samples were taken and the



EXPERIMENTAL APPARATUS FOR THE PURIFICATION OF OYSTERS FROM POLLUTED AREAS.

results of previous experiments made by three official laboratories were considered. The question was then put as to the desirability of continuing the demonstration to determine any unanswered points which might have arisen. No objections were raised and it was decided that with one more official test upon oysters from highly polluted areas the demonstration might be closed. The scientific possibility of the self-purification of oysters was accepted under commercial conditions and there only remained the administrative problems of regulating the operation of the process.

Having demonstrated the practicability of shellfish purification and received the approval of experts representing the health authorities having jurisdiction over the sale of such shellfish grown

in New York State waters the Commissioner requested a conference between the official representative of the Surgeon-General of the U. S. Public Health Service, the Chief of the U. S. Bureau of Chemistry, and the U. S. Commissioner of Fisheries, the Commissioner of Health of the State of New York and the Commissioner of Health of New York City, to consider means for making the method available to the oyster planters. Unfortunately, a representative of the State Department of Health could not be present at the meeting held in New York City on September 27, but each of the other departments was represented.

No question of the desirability and efficacy of the method demonstrated was supported. It was unanimously agreed, however, that the operation of any such method should be under the official supervision of some responsible governmental agency as an administrative health measure and that appropriate inspection of the product be made to insure that it met approved standards. The jurisdiction of the Conservation Commission under the Conservation Law determined all that the Commission should be responsible for the regulation of operation, which, however, did not free the health authorities from the responsibility of examining the product.

A basis for offering a method of purifying shellfish so that the product of restricted areas could be certified under the Conservation Law, had thus been reached and the Commission called a meeting of the Committee of Oyster Growers to report upon the successful conclusion of the demonstration and to inform them of the general conditions under which they might proceed. At this meeting, which was held in New York City on October 18th, the committee was informed that the demonstration under the conditions of the experiments was acceptable to the various authorities. The general nature of necessary regulations were discussed and a definite basis of procedure offered to the industry. Each member of the committee agree that it appeared to be a practical solution of the problem threatening the industry.

Since the official acceptance of the demonstration, steps have been taken by the oyster growers to construct a suitable plant to handle their product, a general meeting of the New York Oyster Growers Association is to be called early in January, and it is



LABORATORY EQUIPMENT AT CORNELL UNIVERSITY FOR THE STUDY OF DAIRY WASTES.

believed that action will be taken to remove one of the principal causes of the decline of the industry.

Studies of Dairy Wastes Disposal

Dairy wastes, because of wide rural distribution, have a particular relation to the fishing streams of the State. Arrangements, already reported, have been made between the Milk Conference Board of New York City, Cornell University and the Conservation Commission for co-operative studies of the effects of and means of preventing any injurious effects of dairy wastes.

To this end, the Milk Conference Board appropriated the sum of \$10,000. Valuable information has already been gathered as a result of the studies this year, which has brought about a better understanding between the responsible parties.

A preliminary survey of the nature of dairy wastes shows the need of three separate kinds of investigation. In general, the wastes may be divided into the two classes considered under our administrative program of *Prohibitive Wastes* and *Treatment Wastes*. The latter are a result of the large number of shipping stations where milk is handled on its way to the city markets. The washings from the utensils and apparatus used at these stations contain a considerable amount of organic matter, mostly dilute milk, which has approximately the same strength as sewage.

The first class of wastes are the result of dairy manufactures such as cheese and butter factories. Such concentrated wastes as whey, skimmed milk and a certain amount of spoiled milk are by-products of these manufactures. In many instances the simplest means of disposal has been to discharge them into the streams. There are other means of disposal of the limited quantities of these wastes which permit complete exclusion from the streams and for this reason they ordinarily should be prohibited.

The third problem arises from the fact that dairy wastes in themselves are not poisonous, but under certain conditions can be utilized in the streams as a source of food for fish life. It follows, therefore, that a knowledge of the biological effect of these wastes under the conditions of their discharge into the streams must be available in determining the resultant effect of the waste upon fish life.

The work is roughly divided into three parts:

(1) The engineering studies of different systems of disposal of sewage now in use, with such modifications as will adapt the same principles to the disposal of dairy wastes.

(2) Chemical reclamation studies, with the idea of treating the concentrated wastes without putting them into the stream directly.

(3) Biological studies of a controlled stream, polluted by dairy wastes.



EXPERIMENTAL EQUIPMENT AT CORNELL FOR STUDYING THE EFFECT OF DAIRY WASTES UPON YOUNG FISH.

Besides these general divisions in the work, there have been supplementary studies, chemical, bacteriological and biological which have arisen as a part of the determination of results of the engineering studies.

Briefly summing up the results of the engineering experiments the opinion may be given that the treatment of milk washings by essentially the same processes as are used in sewage purification have been found practicable. According to the degree of purification which is demanded by the conditions, it is found that by a

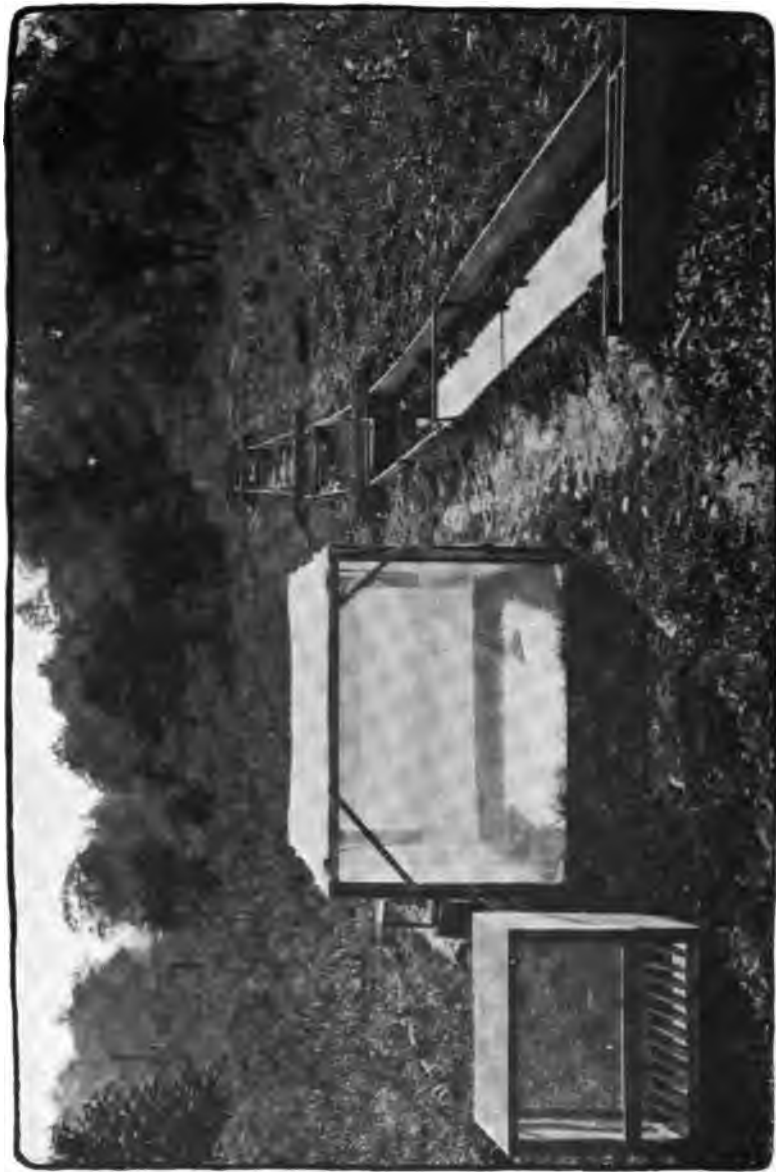
few hours' detention in settling tanks, followed by treatment in trickling filters and ultimately on slow sand beds, the wastes can be reduced to a condition where they will produce no offense upon discharge into a stream. If the stream is of sufficient volume to absorb larger quantities of organic matter that remains after complete treatment, the last step in purification can be omitted. Likewise, the second step may not be found always necessary and under some conditions the wastes may be discharged directly without any injury to the stream. In order to try out the results of the studies on a commercial scale it is desirable now to install units at some of the plants and determine their practicability under industrial conditions.

The utilization of concentrated dairy wastes still is a serious chemical problem. Where farmers keep hogs much of the by-product of dairy manufactures is taken for feeding. It is not economical to keep hogs especially for this purpose, however, because the supply is irregular and may only exist during part of the year.

Experiments on chemical treatment of the concentrated wastes have yielded some very promising results. It has been found possible to precipitate out much of the organic matter in such a way as to yield what may be a valuable stock food product.

From the standpoint of the control of the quality of the streams, however, this problem is not so important to the Commission as it is to the industry. No permits are issued by the State at the present time allowing the discharge of skimmed milk, sour milk, whey or butter-milk into the streams.

The biological studies of stream pollution by dairy wastes have also had a very important result. Contrary to the common belief that everything which may be put into a stream, does not belong there and can do but harm, it has been found by scientific study that much good sometimes results in the end. Thus small streams which in themselves have no value as fish streams prove to be veritable hatcheries of blood worms and other choice articles of diet for the larger fish in streams into which they flow. In one case the milk waste which was too dilute for hogs was converted into blood worms in the feeder stream at the rate of five to ten pounds an hour. This source of food was a great attraction for



AN ARTIFICIAL, SCIENTIFICALLY CONTROLLED STREAM AND POND AT CORNELL FOR STUDYING THE EFFECT OF DAIRY WASTES UPON FISH LIFE.

the fish below, which were seen in large numbers. In fact, a water to be fertile must contain the substances from the land which are turned into fish food.

While the above observations may be quite interesting as a problem in fish food production, one must be careful not to generalize to the extent of minimizing the evil effects of pollution.



SHELLS OF BLOOD WORMS WHICH THRIVE UPON DAIRY WASTES, AND MAKE FISH FOOD.

Of the deleterious effect upon fish life of chemical pollution there can be no question, and even in the case of organic pollution which subsequently might have some beneficial effect, it cannot be denied that the introduction of too large quantities of such wastes will absorb the oxygen from the water, by the natural

processes of decomposition, and make a large portion of the stream uninhabitable to fish life. Moreover, the indirect effect upon fish life due to other changes in the stream may be more harmful than the primary effect upon the fish themselves.

Ultimately, all life in the waters depends upon certain ingredients which are derived from the land. Which of these substances are injurious must be determined by careful study of the particular situation. Each case must be judged upon its own merits, and the purpose here is to bring out the fact that there are two sides to the question, which can be judged only after careful study of all the effects. Both field and laboratory experiments must be performed before general conclusions can be reached and these will require much time and study.

Summarizing the results of the studies conducted by Cornell University for the Milk Conference Board of New York City, in which it was understood that the Commission would co-operate in

solving the problem of treating dairy wastes so as not to be detrimental to fish in the streams, it may be stated, in general, that these results seem to clarify the situation to a considerable degree. It seems to be clear that there are conditions where treatment of wastes are not necessary at the present time: where treatment may be necessary at the present time: where exclusion of the wastes



EXPERIMENTAL EQUIPMENT AT CORNELL FOR THE TREATMENT AND DISPOSAL OF DAIRY WASTES.

from the streams is sometimes possible as the most practical method of preventing injury. It further seems to be clear that where milk washings may be detrimental, it is possible to prevent injury by certain simple disposal works such as have been tried out at Ithaca. Moreover the experiments offer suggestive promise that some of the more concentrated wastes, which must be excluded from the streams, can be handled in some manner so as to use a product of value.

With this information agreed upon, it would seem that the next problem will be to actually determine standards of regulation for

the guidance of the Commission in the enforcement of the law. Where it is evident that treatment is necessary or desirable, it would seem that at that place small treatment works, based upon sanitary engineering practice, such as have been determined in this investigation, should be installed to determine further the practicability and efficiency of operation in actual practice. The burden of such experimental plants would seem naturally to fall



UNTREATED DAIRY WASTE; WASTE AFTER IT HAS PASSED THROUGH AN IMHOFF TANK; AND CLARIFIED EFFLUENT AS IT COMES FROM A PERCOLATING FILTER.

more upon the individuals benefited rather than upon the whole industry which has already contributed in the solution of the problem.

The studies on the reclamation of products from concentrated dairy wastes does not seem to concern the Commission to as great a degree as the voluminous washings, because it is possible to exclude concentrated wastes from the streams. As a matter of fact permits are not issued for the discharge of concentrated wastes into the streams at the present time and, therefore, it would appear as though the studies of these wastes were directed more particularly to securing economy in the industry than to protecting the streams.

RELATION OF STUDIES ON FISH FOOD TO POLLUTION OF WATERS

Dividing the general effects of wastes upon the fishing conditions in the stream, three classes may be roughly defined. First, the most obvious effect, and the one which is associated in the popular mind with the misunderstood word "pollution," is the toxic effect of certain chemical poisonous substances directly upon the fish. A very large number of scientific experiments indicate that this exaggerated effect is on the whole a very minor one, ex-



SMALL-MOUTHED BASS TWO DAYS, TWO WEEKS, THREE WEEKS, AND SIX WEEKS' OLD.

cept in the cases of intermittent wastes carelessly thrown into the streams. The habit of considering a stream as a general dumping ground leads to the discharge in to the stream at intervals of such substances as lime, distilling residues from wood alcohol factories or gas works, acids and mineral salts obtained in chemical manufacture, and other chemical products. An area of chemical pollution, deadly to fish, reaching across the stream and flowing downward, acts as a chemical net, sweeping all the fish before it. Such conditions are unnecessary and can be guarded against by stream

patrol and by warning to manufacturers. Ordinarily the small amounts of these substances in the water are not sufficient directly to cause the death of fish.

Secondly, the effect of organic wastes is to cause the absorption of air or oxygen in the water with the final result that all higher



THE FIRST MEAL OF A TWO-DAY OLD BASS, 7 MIDGE LARVAE, 2 WATER FLEAS, MAGNIFIED 25 TIMES.

life is suffocated. Perhaps the bulk of cases reported, are due to this effect of organic wastes. The study of dissolved oxygen in the stream, and the result of the absorption of this oxygen by wastes, is one of the most definite fields for regulation of wastes at the present time. The factors involved are definitely understood, and by scientific tests the result upon fish life can be accurately determined.

The third and perhaps most important effect upon fish life is the indirect loss of the food in the water which the fish nominally depend upon. Professor Ward has fairly pointed out that the injury to the wild life in an area, because of the elimination of the vegetation by a forest fire, is far greater than the direct loss of life due to the fire itself. The discharge of various substances into the stream causes a direct change in the nature of the water so as to alter the fish life in the stream indirectly. This effect is very far reaching and at the present time but little understood. The problem for the biologist is, therefore, to work out the food requirements of fish in order to determine what effects pollution has upon these sources of food. Such studies are very involved and will require years of patient study before it will be possible to determine the result of polluting substances on fish food.

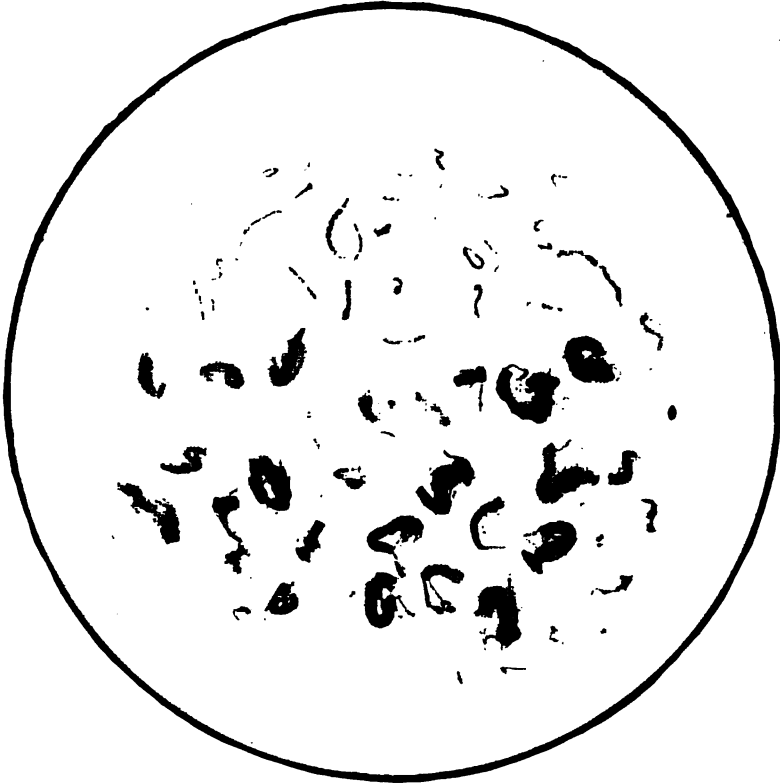
Since studies on the oxygen requirement of the streams are made not only for the purpose of determining the suitability of the waters for fish life, but are vitally important in sanitary studies a great deal has been done on the chemical side of the work. Furthermore, the direct effect of wastes upon fish have likewise been determined and in general prevention in these cases appears to be more an administrative than chemical problem. Being intermittent, the damage is at first observed after the cause has passed by, and by collecting samples of the water, it is not possible to show the reason of the mortality.

Inquiry into the case, however, usually discloses the source of the epidemic and it is possible without elaborate scientific investigations to prevent its recurrence.

Studies on fish food, however, are particularly the problem of the Conservation Commission and other governmental agencies responsible for the protection of fish life. For this reason the Commission should provide for the support of biological studies on fish food and the various conditions which occur in the stream. No immediate administrative results should be expected, but after the course of years the accumulation of information will indicate measures which may be adequate and just. At the present time only the more obvious cases of pollution can be decided, although it is known in a general way that the effects on the streams are far wider than can be proven by the direct killing of fish. Areas

which formerly were fine fishing water have, in many instances, been converted into biological deserts.

During the past summer, Dr. Moore has conducted an elaborate



THE MEAL OF A SIX-WEEKS' OLD BASS, INCLUDING DRAGONFLY NYMPH, MIDGE LARVAE, CRUSTACEA, AND A BEETLE, MAGNIFIED 2 TIMES.

series of studies on the food for fish at the canal ponds near Schuylerville and at Lake George. The work, as carried out, aims to give information of value in fish culture by indicating the best program for planting of fish. It is true, however, that all studies of this sort form the groundwork for determining the effect of polluting substances on fish food, and indirectly on fish life. Mention is, therefore, made of these studies in this connection.

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DIVISION OF FISH AND GAME

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DIVISION OF FISH AND GAME

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DIVISION OF FISH AND GAME

LLEWELLYN LEGGE*Chief Protector*
JOHN T. McCORMICK.....*Deputy Chief Protector*
JOHN W. TITCOMB.....*Fish Culturist*
MANNISTER C. WORTS.....*Superintendent of Inland Fisheries*
EMMETT B. HAWKINS...*Supervisor, Bureau of Marine Fisheries*

DIVISION OF FISH AND GAME

RECEIPTS

June 30, 1920 marked the closing of the most successful fiscal year in the history of the Division of Fish and Game. All records of former years were surpassed. The total receipts for this year were \$424,096.79. This is an increase of \$41,597.28 over the receipts of a year ago.

In addition to the cash receipts of the Division, the estimated commercial value of the fish raised and distributed in the State's fish hatcheries was \$243,921.50. The estimated commercial value of eggs and birds distributed from the game farms, and of adult birds retained for breeding stock, was \$78,272.25. The value of the hatchery and game farm product when added to the cash receipts, thus makes a total of \$746,290.54. Against this must be placed expenditures for the maintenance of the Division amounting to \$586,447.74. This Division according shows a net profit in cash or its equivalent of \$159,842.80.

Receipts of Division of Fish and Game

Fiscal Year Ending June 30, 1920

Hunting and trapping licenses.....	\$273,361 90
Fines and penalties	70,332 07
Net licenses	30,263 69
Tax and rental on shellfish grounds.....	25,133 00
Non-resident fishing licenses.....	11,372 28
Tagging of game.....	3,786 20
Dog licenses (Section 193).....	1,980 00
Trout tags	1,742 00
Breeder's licenses (Section 372).....	720 00
Importation licenses (Section 178).....	606 00
Propagation and collecting licenses (Section 159).....	277 00
Fur bearing animal licenses (Section 200).....	180 00
Spearing licenses (Niagara river).....	68 00
Breeder's licenses (Section 377).....	10 00
Rental on trout tagging machines.....	4 00

Sale of confiscated steel traps.....	\$6 00
Sale of special protectors' badges.....	32 00
Sale of carp and suckers (Bemus Point).....	65 00
Sale of trout tagging machines.....	198 00
Sale of confiscated skins.....	951 65
Sale of herring (Sodus Bay).....	2,175 00
Sale of licenses to possess venison.....	833 00
	<hr/>
	\$424,096 79
Commercial value of pheasants raised and distributed from game farms..	\$39,644 00
Commercial value of eggs distributed from game farms.....	32,128 25
Commercial value of 1,300 hens raised and kept for breeders.....	6,500 00
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	78,272 25
Commercial value of fish distributed from fish hatcheries	243,921 50
	<hr/>
Total	\$746,290 54
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GAME PROTECTION

Cases and Recoveries. The game protectors during the fiscal year ending June 30, 1920 prosecuted 4,269 cases of violations of the Conservation Law, and were successful in 4,190 instances, or 98 per cent. That is to say, in only 79 cases were judgments rendered adversely to the State. Included in these 79 cases are investigations, and cases which, after a review of the facts, the Commission ordered discontinued in the absence of sufficient evidence to successfully prosecute. Each year there are a few actions instituted in which the protectors are satisfied to a moral certainty of guilt of the defendant, but which when reviewed by counsel to the Commission are found to be such that the evidence would not hold in court.

These 4,269 cases are an increase over last year of 20 per cent., or in round figures, 723 cases, and gives an average of approxi-

mately 33 cases for each protector, or approximately 3 cases per month for each man on the force during the year. Last year the average number of cases per protector was 27.

The total recoveries realized by the State in fines and penalties from the prosecution of these cases were \$74,143.30. This will differ somewhat from the amount turned over to the Treasurer, as it represents the gross amount of fines and penalties, while figures shown elsewhere as receipts from fines and penalties are the actual moneys received by the Commission from the courts after court costs, etc., authorized by the statutes, have been deducted. This is an increase over the amount collected last year of \$8,733.55, and a gain of approximately 14 per cent. It is an average recovery for each protector of \$565.97.

Court Costs. A few years back the Commission started a course of training designed to improve the knowledge of its protectors on court procedure to a point where they might appear in court and act as prosecuting officers in cases started, thus saving the State money which it had formerly disbursed to attorneys for such work. From the beginning the course proved a success, the average cost of prosecuting cases gradually lessening. How successfully the result desired was achieved is best shown by a comparison of the years 1910 and 1920. In the year 1910 the average cost of prosecuting each case was \$5.45, while the average cost per case this year is \$1.32. The court costs, constable fees, attorney fees, and other charges incidental to the prosecution of 4,269 cases during the year amounted to only \$5,644.73.

Additional Protectors Needed. The foregoing figures of cases and recoveries, while they appear large and are large, would greatly suffer by comparison with what we would have to report were there available to the Commission a protective force in numbers sufficient to properly patrol this state. The protective work can not be properly done, even with the most efficient force, unless the force is materially augmented. To appreciate the inadequacy of the force as at present constituted, it is only necessary to consider that 131 game protectors are required to patrol more than 49,700 square miles, which comprise the State of New York, or an average of approximately 375 miles to each protector.

Seizures. During the fiscal year 275 seines, gills, traps, fykes

and scap nets were seized. The estimated commercial value of these nets is \$9,982.25.

In addition to the above, the protectors also seized 2,795 under-sized lobsters, bass and trout, game birds, song birds, insectivorous birds, and other miscellaneous species, illegally taken or possessed. After these seizures had outlived their usefulness as evidence they were disposed of to charitable institutions, if fit for food; otherwise they were burned or buried.

During the year there were 396 skins and pelts, representing about every species of quadruped protected by law, confiscated



SCARCE HEAVY AS A THIMBLE ON THE FINGER.

by the protectors. The money realized from the sale of these skins amounted to \$951.55, or an average per skin of approximately \$2.50. While these figures may upon cursory examination appear low, nevertheless, when it is understood that the greater number were removed from animals which were unlawfully taken during the close season, a time when the fur is practically of no value, it will be seen that the prices obtained were fair. Receipts from the sale of skins last year amounted to \$352.75. This year's seizures over last represent a gain in dollars and cents of \$589.90.

Launches. The state launches operated by the Division of Fish and Game very forcibly demonstrated their effectiveness as an aid to the protectors in patrolling the waters of the state during the past year. For years the protectors were handicapped by a

lack of facilities to adequately cope with the class of violations that take place on the water. The only means formerly available to them in patrolling lakes and streams were hired rowboats, and concealing themselves in the brush along the water's edge until the violators came ashore, which methods never proved very efficient. But with the placing of launches on the larger lakes and streams there was immediately noticeable a gradual lessening of the complaints received and an appreciable increase in the number of violations reported. A more wholesome respect for the law has been instilled in the fishermen, which is emphasized by the increased number of net licenses applied for and issued. It is estimated that as a result of the additional activities of the protectors on the water, made possible by the acquisition of these launches, the money realized from the issuance of the additional net licenses and from fines collected from violators who otherwise would not be apprehended is a sum about sufficient to maintain the boats.

Ratings and Salaries. The system for the rating of the protectors into grades according to merit and efficiency has now been in force for eight years, and this year finds a greater number of men eligible for rating in the first and second grades than in any previous year. This indicates that the efficiency of the protective force is increasing and that the system has provided the incentive necessary to spur the men on to their best efforts. Qualification in the first grade carries with it increased salary of \$100 per annum, and qualification in the second grade increased salary of \$50 per annum. Protectors failing to make either of these grades go into the third grade and receive no benefits. The competition among the protectors to outdo each other in qualifying for these grades has borne excellent results, and the rivalry among the men to head the list has contributed largely to maintaining the force at a high degree of efficiency.

Many protectors doing duty at present were on the protective force when the law regarding rating became effective, and have each year qualified in either the first or second grades, until they are now drawing the maximum salary allowed by law, which is \$1,500. At the time this law was written, and the maximum salary to which a protector might raise himself was fixed at

DIVISION OF FISH AND GAME

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trout; three, all species of fish in certain waters, and five, the use of tip-ups in certain waters and in the taking of certain fish. On pages 143, 144 and 145 of the Conservation Law appear additional protection orders now effective.

Each year a few persons are apprehended for violation of an order giving increased protection to a species, and offer in defense the fact that there is nothing in the general law affecting the animal taken that would suggest that the Commission had afforded it protection other than that fixed by the statute. In addition to having the additional protection periods published in the Game Law in table form, there now appears at the foot of each section of the law affecting an animal to which additional protection has been granted, a note calling attention to the fact and covering fully just in what way the protection has been modified.

Beaver. That the stocking of a few of the northern counties of the state with beaver a few years ago has been a success, there is no question. For the past decade they have been afforded protection by a close season the year round, have bred freely, and now are found in almost every section of the Adirondacks. In the past five years they have become so numerous in certain localities as to be destructive. During the past year many requests have been received from owners of lands flooded by beaver for permission to take them. Such permits in some instances have been issued, but not, however, until an investigation made by a game protector proved that the real facts were not at variance with those set forth in the request. Were these permits to be issued promiscuously, many undoubtedly would find their way into the hands of persons not in any way affected by the activities of the animals, but only interested in procuring the pelts. Permits are issued only with the understanding that the pelts of animals taken will be immediately removed, properly salted and forwarded to this Commission without unnecessary delay. In the past year the Commission received from the holders of these permits fifty-three pelts.

In addition to the individual permits issued to owners of lands, the Commission adopted an order on March 26, 1920, authorizing and directing game protectors and forest rangers to tear out beaver dams and destroy beaver houses where extensive damage was

being done to State and private lands by the cutting of trees and by building dams which flooded large areas, causing the death of timber. These orders expire by statutory limitation in four months from date of issue, and have twice been renewed.

Rabbits and Ferrets. For the first time in a number of years the Commission did not grant any orders for the use of ferrets in the taking of cotton-tail rabbits during the open season. With the law amended so as to extend the open season for the taking of these animals to include, in addition to October, November, December and January, the month of February, the Commission did not feel that they could stand, without becoming unduly depleted, the additional drain to which they would be subjected were the use of ferrets permitted. Petitioners for the use of ferrets in taking rabbits usually set forth the argument that the animals have become so numerous that they are menacing property. Only reasons of this kind could warrant the taking of favorable action on these petitions. During the past year the Commission received but two such petitions, both of which, upon investigation, proved to be unfounded in fact.

The greater number of farmers and sportsmen seem to share the opinion of the Commission that under present conditions there no longer exists any valid reason for the issuing of permits to use ferrets. This condition, it is felt, is the result of the greatly increased number of sportsmen now hunting rabbits, and of the lengthening of the open season. Of course, should the rabbits in any particular locality multiply to a point where they are destructive of private property, there remains the remedy which permits the owner or occupant of such property to take the rabbits by any means, except by use of ferrets, provided the rabbits so taken are not possessed, bought, sold or trafficked in.

LICENSES AND TAGS

Hunting and Trapping Licenses. The sale of hunting and trapping licenses covering the fiscal year ending June 30, 1920 netted the State \$273,361.90. In this figure is included \$32,000 received from the sale of 3,200 non-resident hunting and trapping licenses at \$10 each. This is a gain over receipts from this

source last year of \$25,487.96. While a substantial gain, it would be larger but for the amending of the law increasing from ten to twenty-five cents the fee allowed clerks for the issuing of these licenses. The increase was carried by the State, and consequently reduced the sum which the Commission received from the sale of each resident hunting and trapping license from one dollar to eighty-five cents.

When the hunting license law was amended to require a hunter to wear a hunting license button when afield, in addition to carrying the hunting and trapping license, the button was furnished by the State without additional cost to the hunter. It was intended that the raising of the clerk's fee from ten to twenty-five cents should compensate him for the additional work incident to the handling and issuing of these buttons and the making of additional necessary reports. As the original fee of ten cents to which the clerk was entitled was borne by the hunter, the Commission feels the increase should also come from the same source. It therefore recommends that the law be amended by placing the price of a resident hunting and trapping license at \$1.25, the twenty-five cents to be retained by the clerk.

Confiscation of Licenses. Each hunting season prior to 1916 brought its flood of letters to the Commission from sportsmen, farmers and others interested in conservation, complaining of hunters seen afield who had not complied with the provision of the law requiring every person in pursuit of wild animals or birds to have a hunting and trapping license on his person. It was thought in 1916 that if hunters were obliged to wear a button in a conspicuous place on the clothing, the button to be furnished to them at the time of taking out their licenses, it would not only be the means of making the unscrupulous hesitate before going afield without a license, but would also remove the suspicion hunters have of each other when afield. The Commission requested the Legislature to amend the law so as to provide for the wearing of a button containing a number corresponding to the number of the license, in addition to carrying the license. As was hoped, the result of this amendment was reflected in the increased number of hunting and trapping licenses issued by the

Commission in the year following, and in the material lessening of complaints. The penalty provided for failure to wear the button in plain sight or carry the license when afield is forfeiture of the license. During the year 574 hunters forfeited their licenses to the protectors for violating this provision of the law.



"MAY I SEE YOUR HUNTING LICENSE, PLEASE?"

Non-resident Fishing License. In 1915 the Conservation Law was amended to require a license for non-residents to angle in the fresh waters under the jurisdiction of the State of New York, and placed the price of the license at \$2.50, fifty cents of which is retained as his fee by the clerk issuing the license. Since the passage of this act, the revenue from the sale of these licenses has been steadily increasing. Last year it amounted to

\$8,792.18, while this year's receipts were \$11,372.28, a net gain of \$2,643.10.

Combined Hunting, Trapping and Angling License. The Commission feels that the Legislature should amend the Conservation Law so as to provide for a license to take fish by angling. At present the law provides for a license to hunt and trap, but no license is required to take fish by angling. The money paid into the State treasury yearly in license fees by hunters and trappers amounts to approximately \$275,000. In return, aside from granting the privilege of hunting and trapping, the State stocks the covers of the State with pheasants from three game farms, the output of which in the year of 1920 amounted to 9,911 birds and 91,735 eggs, the commercial value of which is estimated at about \$78,000.

The fishermen of the State, who pay no fees for the privilege of angling, receive the benefits of the stocking of streams and lakes from twelve fish hatcheries, which yearly amounts to over five hundred millions of fry and fingerlings. There is no accurate method of determining the exact commercial value of these fish, as many of the species put out have no market, but a conservative estimate of the value of this year's output is \$244,000. Yet toward the maintenance of these hatcheries the anglers, who are the largest beneficiaries, do not contribute a penny in the way of special tax for the privilege of angling.

It has never been maintained by a person familiar with the safeguards which the State places about its game to insure its future, in the way of providing game protectors to guard it, and by replenishing the depleted covers with pheasants, that the charging of a nominal fee to hunt and trap is unjust. But there do come to the Commission many times during the course of a year inquiries as to why anglers are not obliged to take out licenses, in view of the many hatcheries maintained by the State for the stocking of the waters.

If the law should be amended to provide for an angling license, it is estimated that the additional money that will come to the State as a result will be sufficient to maintain the hatcheries and

a part of the game protective force, and will thus bring about a more equitable distribution of the cost of maintaining the State's agencies for protection and restocking which, from the viewpoint of the hunter and trapper, are today shouldered alone by the men who shoot and trap.

The Commission, therefore, recommends that section 185 of the Conservation Law be amended to provide for a combined hunting, trapping and angling license, carrying the same exceptions as now carried by the hunting and trapping license, the price to be \$1.25, twenty-five cents of which should be retained as his fee by the clerk issuing the license.

Game Breeding License. There are in this State engaged in the business of raising elk, black and mallard ducks, deer, Canada and Hutchins geese and pheasants for food purposes, under the license provided for in section 372 of the Conservation Law, 140 persons. A license under this section permits the holder to raise these species and, when killed and tagged under rules prescribed by the Commission, to sell them for food purposes. To the passage of the law legalizing the raising of game for food must go much of the credit for the fast disappearing pot hunter and his illicit market. The Commission received from the sale of these licenses \$720 during the last fiscal year.

Licenses to Raise Fur-Bearing Animals. There were thirty-six licenses issued under section 200 to engage in the business of raising protected fur-bearing animals for commercial purposes. The fee prescribed by the law for a license under this section is \$5, and the money received by the State from the sale of these licenses this year amounted to \$180, as against \$105 last year.

Every encouragement is given to persons contemplating entering this business. The only requirement insisted upon is that breeding stock be acquired in a legal manner, and that disposal of stock be not made during the close season for the animals in their wild state. The raising of fur-bearing animals in captivity not only lessens the drain on the wild animals, but also results in a better grade of fur, through selective breeding.

Licenses for Scientific Purposes. From the sale of licenses for scientific purposes, under subdivision 1 of section 159, the Commission received \$35. The fee provided by law for this license, when exacted, is \$1. Not in all cases, however, is a fee collected, the law making certain exceptions. Therefore, this \$35 does not represent 35 licenses issued, nor does it indicate the amount which the Commission could collect from the sale of these licenses were it to place one in the hands of each applicant. The intent of the statute is to provide a legal means whereby public museums, scientific societies, officers thereof, and others properly equipped may carry on research work. This license permits the holder to collect at any time all species of protected life for scientific, educational and public exhibition purposes. When application for a license is received, the Commission requires the applicant to file written testimonials from two well known scientific men. When testimonials are filed, it is required that a bond be given in the penal sum of \$200, with two responsible sureties approved by the Commission, that the applicant will not avail himself of the privilege of the license for purposes not therein set forth. Failing in any of these particulars, the application is rejected. Every precaution is taken that these licenses do not find their way into the hands of those for whom they were never intended. If a license was issued to every applicant, receipts from this source would be vastly larger, and an unjustified drain upon wild life would result.

Importation Licenses. Section 178 of the Conservation Law makes provision for the importation of game from without the State during the close season therefor in this State, and of game for which there is no open season in this State, under a license issued by this Commission. The only restriction is that the game must be legally acquired and exported from the place where taken. Of these licenses the Commission this year issued 606, which, at \$1 each, netted the State \$606, a gain over last year of \$241.

Dog Licenses. Prior to 1916, the taking of dogs into the Adirondack or Catskill mountains or into forests inhabited by deer was prohibited. In that year the law was amended to allow the taking of dogs into these parks and forests under a license

issued by the Conservation Commission, for use on such species of game as the law did not expressly prohibit. This year approximately 1,900 persons availed themselves of this privilege, the receipts amounting to \$1,980, a gain over last year of \$745.

Licenses to Possess Venison. The number of licenses issued by the Commission for the possession of venison after the close of the open season for deer in the year 1919 was 833, which far exceeded the number ever issued in any previous year. The reports of hunters contained on the stubs of licenses issued to them in 1919 indicate that the deer killed in 1918 numbered not less than 8,293. In that year, 1918, there were 378 licenses issued for the possession of venison, which indicates that approximately every twenty-second person obtaining a deer took out one of these licenses. In the year 1919 there were 833 such licenses issued. If the ratio of one license to every twenty-two deer taken, which existed in 1918, prevailed in the year 1919, there were not less than 18,326 deer killed in this open season. Data obtained from other sources leads to the conclusion that more than 20,000 were killed, or more than twice as many as in 1918. The sale of importation licenses bears out this conclusion. As the law permitting the taking of does has been repealed, this data, perhaps, is only interesting at this time in that it serves as another convincing argument that the amending of the law in 1919 to permit the taking of female deer was wrong, and that if it had been allowed to continue on the statute books it would in a short time have resulted in the depletion of the species to a point where it would have required years of the most stringent protection to bring them back again to reasonable abundance.

Tagging of Imported and Domestic Game. During the past five years the importation of game from without the United States has been very much curtailed, due to war conditions, reaching its lowest ebb in the fiscal year ending June 30, 1919, when but \$706.35 was realized from the sale of tags. It is from European countries that the largest importations are made. As conditions in those countries become normal, our receipt from this

source will gradually increase. This year we have to report the sum of \$3,786.20 from the tagging of imported game.

Trout Tagging Machines. From the sale of trout tagging machines the Commission received \$198. Last year the Commission had no receipts to show from this source. This \$198 is shown as a receipt because it was actually received and deposited in the State treasury, but the State is not richer by any sum, as machines are furnished to licensed hatcheries at the exact cost to the Commission. The life of a machine is from six to eight years, which accounts for the absence of receipts during some years.

Trout Tags. The receipts from the sale of trout tags amounted to \$1,742, which, while smaller by \$148 than those of last year, is not to be construed as indicating that the business of artificially propagating trout for consumption is on the wane. Receipts from this source do not vary much from year to year. The number of hatcheries in the State raising trout for the table is about the same as it was immediately following the passage of the act legalizing the industry, and their output fluctuates very little.

GAME FARMS

From the standpoint of production, the three game farms enjoyed most successful years, and this in spite of the fact that it was at times almost impossible to hire adequate labor to operate. It was only during a short period of the time that the farms had their full quota of help. However, throughout the year, conditions continued uniformly good, the birds passing through the winter and through an exceptionally heavy laying season without any serious suffering from disease, and with a lower mortality than in any previous year.

Egg laying began earlier than in former years. The first eggs were laid about April 15th, and continued through to the end of the season. Egg eating, which in times past has often assumed grave proportions, was effectively checked during the

laying season. This practice of the birds was overcome by the feeding of a special ration. The loss of eggs from this source during the year was small.



MAINTAINED IN PRIME CONDITION AT THE GAME FARMS.

Eggs were set earlier than usual. The first application for birds was filled on July 15th, and shipment continued until all applications were exhausted. The filling of applications for eggs commenced on May 1st, and continued through the summer and well into the fall.

There were 1,392 applications for pheasant eggs and 604 applications for young birds filled. The eggs distributed totalled 91,735, and the birds 9,911. The number of eggs distributed this year is larger by 65 per cent than the number distributed during the preceding year.

This year the Commission allotted eggs to protectors for placement with such farmers of their respective districts as would accept and hatch them. While this was a departure from the established custom of distribution, it was made necessary by the continuous laying of the pheasants, making available thousands of eggs in excess of the number estimated. Disposition of the eggs in this manner was suggested by numerous letters requesting eggs, received from farmers each year in the fall months, and too late to be regularly acted upon in the current year. It was made known through the press to the farmers that the protectors were to have eggs for distribution, and the manner in which they responded was very gratifying. Requests were received for more eggs than could be supplied, and those persons whose requests it was found impossible to fill will be among the first to receive eggs from next year's supply.

The services of the Superintendent of State Game Farms were placed at the disposal of clubs interested in the propagation of pheasants. The first club to avail itself of this offer was the Broome County Sportsmen's Association, which has established a small farm for the raising of pheasants for stocking purposes. The Commission was asked for its advice in the selection of a suitable site to carry on the work, which was given, together with an estimate for equipment, food, labor, and other details. The men engaged by the club to operate the farm, being inexperienced, were taken to the game farm at Sherburne and there instructed in the mixing of food, preparing of nests, setting of hens and care of the young. The success of the club in its first year was very encouraging. Four thousand five hundred eggs were furnished and set, 3,825 eggs hatched out, and 2,280 birds were raised to liberating age and turned loose in the covers of the county best adapted to their habits.

Other clubs and associations to be furnished with large numbers of eggs were the Rome Fish and Game Protective Association, Sherill Rod and Gun Club, Lockport Rod and Gun Club, Niagara County Anglers Club, Fish and Game Protective Association of Little Falls, Ilion Fish Club, Utica Fish and Game Protective Association, Chemung County Rod and Gun Club, and Bainbridge Fish and Game Club. In addition to these, numerous other clubs received small allotments. A few clubs leased parcels of land upon which to raise the birds, while others distributed the eggs among members for hatching. Reports so far received indicate that a larger percentage of birds than usual were raised and liberated.

As far as practicable, the environment at the game farms, under which the pheasants are raised, is kept as nearly as possible similar to the conditions which the birds will find in the covers of the State when liberated. All birds raised for liberation are allowed free range and are in no way interfered with until trapped up for shipment. While a number of the birds make their escape as a result of this freedom, they migrate to the surrounding territory and there take up their abode. By permitting the young birds to run at large, they retain all their wild instincts, become acquainted with their natural enemies, find the different insects which are so important a part of their diet, and become accustomed to the vegetation which forms their principal food during certain periods of the year. Birds raised under these conditions grow very fast, are hardy and vigorous, and are not readily afflicted with enteric, or so-called cholera, a disease to which they are susceptible, and which, in years when pheasant raising in this State was in its infancy, exacted a yearly toll often running as high as three-fifths of the birds hatched. Under present conditions the mortality from this disease is negligible.

Signboards, inviting persons to visit the game farms, which the Commission caused to be placed along the roads leading thereto, were conducive of results. The number of visitors at the farms this year was larger than the combined number of the three previous years. Only a few of these people seemed to be impelled

by mere curiosity, the larger number being persons who had read of the work being accomplished at the farms, had witnessed its fruits in the covers of the State, and had come seeking information because of their interest in game breeding and in the future of our wild life. These people were treated with every courtesy



GAME PROTECTORS BRING RELIEF WHEN
STORMS ARE HEAVY.

and made to feel welcome. Many of them were sportsmen who expressed themselves as surprised with the magnitude of the work and the thoroughness with which it was carried on. Not a few seemed to think that, owing to the fast diminishing covers for our native game birds, the pheasant is to be the game bird of the future, due to its easily adapting itself to open areas and populous sections. As proof of this they

called attention to the increased number of these birds and the rapid strides which they are making in becoming established.

To persons into whose hands the Commission placed pheasants and pheasant eggs last year, valuable assistance was rendered by the protectors in the way of suggestions as to rearing and the selection of suitable covers for liberation. While last year was the first year this procedure was followed generally, it showed such excellent results that it has been established as a permanent policy. Reports so far received from persons who raised birds indicate that a larger percentage was brought to liberating age than in former years.

Last winter was an exceptionally hard one on the birds that inhabit this State the year round, and particularly the pheasants. The continued cold weather, which was accompanied by heavy snows, placed the natural food of the pheasant during much of the winter beyond reach. This condition first came to the attention of the Commission through the weekly reports of the protectors covering game conditions. Immediately an order was issued directing the protectors to purchase corn and place it in the localities where the pheasants were wintering. Much of the corn was obtained from farmers, who, upon learning of the purposes for which it was to be used, in many instances not only refused to accept compensation, but placed their time and equipment at the disposal of the protectors for carrying on the work. This is indicative of the general attitude of the farmers toward these birds and is evidence that they are becoming more appreciative of their economic value to agriculture. That the placing of corn bore good results is attested by reports received from all sections of the State in the spring.

Cornell University Game Farm. In 1917 the Legislature passed an act authorizing the trustees of Cornell University to select a site and establish a game farm for the purpose of conducting practical experiments and giving instruction in the breeding of game. It was also provided that the experimental work in the breeding of the game be conducted in cooperation with the Conservation Commission and that the surplus product of the farm be annually placed at the disposal of the Commission. The product of this farm, at the end of the breeding season of 1920, over and above requirements to carry on experimental work, was 931 birds and 3,530 eggs, which were distributed to applicants.

VERMIN CONTROL

The Commission has continued its campaign against vermin during the past year, with the result that the protectors killed 5,545 animals and birds of nineteen different species, as against 2,887 last year, all recognized as foes of crops, poultry, and our more useful protected game. Of the animals destroyed, the cat, crow and woodchuck predominate. The crows and woodchucks

and other vermin are killed whenever an opportunity to do so is afforded, but the cats are killed only when found in the possession of protected birds or animals or in pursuit of them. There were 936 such cats destroyed last year. It is estimated by some authorities that a roving cat kills in a year as many as fifty birds. It therefore can be readily seen that a tremendous saving in wild bird life has accrued to the State from the killing of these cats. The destruction of crows amounted to 1,844, but this figure repre-



THE FOUR WISE MEN.

sents only the number killed by rifles in the hands of the protectors. The woodchucks, one of the most common of pests which the farmer is called upon to combat, numbered 717 killed.

Destruction of Crows. One of the most numerous as well as most destructive enemies of young poultry, game birds, insectivorous birds and agricultural interests is the common crow. This bird has always been considered one of the worst menaces with which the farmer has to contend, the damage to his interests alone resulting from its activities running yearly into hundreds of thousands of dollars. Aside from this, not the least destructive

of this bird's operations is the robbing of nests and the killing of young birds, thus holding in check the multiplication of many of our more valuable species of bird life. For many years the problem of effectively combating the crow was one to which no little amount of study was given. It was not, however, until recently that an effective method of dealing with them was hit upon. The method now used is the treating of corn with a special preparation and placing it on high knolls and stubble fields where crows congregate in large numbers. If it is to take effect it must be eaten by a bird having no crow, and as the crow is the only bird so constructed, which frequents this State during the months when this work is carried



SCATTERING POISONED CORN FOR CROWS ON THE
SUSQUEHANNA RIVER.

on, it is naturally the only bird that will be affected. It is estimated that no fewer than fifty thousand crows were killed in this manner during the past year, and that the saving to the farmers from their destruction amounted to thousands of dollars.

BIOLOGICAL INVESTIGATIONS

In 1919 hunters were required for the first time to make a report of the game killed under their licenses for the preceding year, this report being made on the back of the stubs of the licenses issued in 1919. The last of these stubs were not returned to the Commission until 1920. The data contained on



HE THINKS THE BUCK LAW IS SEX DISCRIMINATION

them was then tabulated, this work taking the entire time of two statistical clerks for a period of nine weeks. In the accompanying table the total results are given, together with the average individual value of each kind of game or fur bearing animal, and the total value of the number reported killed.

This table gives us for the first time in the history of game protection in New York State a picture of the relative importance of the various species of game, both numerically and economically, and reveals many surprising facts which were not heretofore known.

The totals given are by no means complete, for the reason that hunters had no advance information that such reports would be required, and many of them were accordingly not prepared to report accurately. In addition, many town clerks totally disregarded the regulations of the Commission, with the result that the reports from some towns were complete blanks. The insufficiency of the reports was further augmented by the fact that the only space available for the reports in that year was on the back of the stub, which made reporting difficult. The reports, moreover, take no account of farmers who hunt and trap on their own property without a license, nor do they include the very large number of minors under sixteen years of age who are permitted by law to trap fur bearing animals without a license. The total amount of fur taken by these boys in the course of a year is very considerable. The statements made in the following discussion are accordingly thoroughly conservative, since they are based entirely upon definitely ascertained facts. It is only upon such a basis that the supply of game can be continuously maintained under the democratic conditions of open hunting which have always characterized American sport. Each year this hunting has increased in intensity, until we are now face to face with the immediate necessity of learning the facts about our wild life resources, of eliminating guess work, and of administering our remaining stock upon a more rational and scientifically efficient basis. If this is not realized and effective steps taken to that end, we shall shortly see many species of game birds and animals either vanish entirely or become of practically no importance.

It is now anticipated that the reports for 1919 and 1920 will

show decided increases. They will be more complete because the hunters are more interested, and have had advance notification, because all town clerks who have neglected this work have been impressed with the importance of supplying the information, and because space is now provided on the face of the license stub itself for the giving of this information in connection with the other data required.



WHEN HORNS ARE IN THE VELVET.

In spite of the incompleteness of the returns, it is significant that the total amount of game taken in 1918 by 208-946 licensed hunters was 1,526,960, which was an average of more than seven animals or birds for each hunter. When it is considered that many of the licensees did not hunt at all, or were unsuccessful or failed to report, the actual average of the successful hunter is seen to be very much higher. At the valuations given in the table, which are based upon current market prices for game or fur legally saleable, and upon conservative estimates for all other species, this game was worth a total of \$3,239,277. This value, however, was simply the annual dividend, and not the value of the State's capital stock of wild life. If we consider that it was a dividend on the basis of six per cent, then the actual capital value of the State's stock of game and fur bearing animals, on the basis of the 1918 reports of game killed, which are themselves low, is \$53,987,950.

It will be admitted without dispute that the price of preserving the State's great natural resources of wild life is game protection.

For game protection in 1918 the Conservation Commission disbursed approximately \$300,000. Fully one-half of this expense, however, was for the protection of fish, which leaves approximately \$150,000 chargeable against other wild life resources. In addition, it expended approximately \$32,000 for the maintenance of the State game farms, making a total expenditure for protection and propagation of animals and birds, of approximately \$182,000. One of the most important of the conclusions based upon this investigation in economic biology can thus be stated as follows:

The game and fur bearing animals of New York State, if capitalized, are worth not less than \$53,000,000; they return an annual dividend of more than \$3,200,000; and they cost the State for their protection and increase the nominal sum of \$182,000. This cost of protection and increase is thus less than six per cent of the annual dividend.

Tables have been prepared for every species showing the number of birds and animals reported on the license stubs from every county, the counties being arranged to show the ones making the largest reports. These tables thus give a general idea of the relative importance of the various species to hunters throughout the State, when the tables are carefully interpreted. To a limited extent they also show local distribution, but if the species is one for which hunters go far afield, as they do for deer and bears, the table must be interpreted with this in mind before any general statements are attempted. The data cannot be exhaustively analyzed and interpreted here, but nevertheless some of the more interesting and important points will be covered in the following paragraphs.

As this report went to press, the tabulation of game taken in 1919 was beginning. The first county finished, Onondaga showed that with the same number of licensed hunters and similar seasons, muskrats taken in 1919 were one-third less than in 1918, which indicates over-trapping. As this system is continued, such comparisons will be of the greatest practical value in administration of game resources. The present report is simply a start.

GAME TAKEN IN 1918

Reported by Hunters on Stubs of 1919 Hunting Licenses

<i>Species</i>	<i>Number</i>	<i>Individual Value</i>	<i>Total Value</i>
Cottontail Rabbits	465,590	\$0 50	\$232,795 00
Muskrats	399,938	1 50	599,907 00
Skunks	187,703	4 00	750,812 00
Grey Squirrels	115,013	50	57,506 50
Ducks	109,663	2 00	219,326 00
Grouse or Partridge	41,757	2 00	83,514 00
Snowshoe Rabbits	36,170	1 00	36,170 00
Pheasants	35,855	3 00	107,565 00
Raccoons	25,349	5 00	126,745 00
Woodcock	19,249	2 00	38,498 00
Red Foxes	15,156	15 00	227,340 00
Wilson Snipe or Jacksnipe	11,325	50	5,662 50
Black Squirrels	11,028	50	5,514 00
Quail	8,999	2 00	17,998 00
Mink	8,917	6 00	53,502 00
Fox Squirrels	8,437	50	4,218 50
Deer (Bucks)	8,293	75 00	621,975 00
Greater Yellowlegs	3,556	50	1,778 00
Lesser Yellowlegs	2,848	50	1,424 00
Grey Foxes	2,476	2 00	4,952 00
Coots	1,974	50	987 00
Geese	1,380	3 00	4,140 00
Rails	1,328	50	664 00
Golden Plover	1,214	50	607 00
Black-bellied Plover	1,045	50	522 50
Sable or Martin	823	4 00	3,292 00
Otters	591	25 00	14,775 00
Fishers	396	25 00	9,900 00
Brant	241	3 00	723 00
Gallinules	216	50	108 00
Bears	189	25 00	4,725 00
Bobcats	159	10 00	1,590 00
Sora	82	50	41 00
Totals	1,526,960		\$3,239,277 00

Deer. The total number of deer reported killed in 1918 is 8,293. This agrees closely with the number estimated by the Commission on the basis of entirely different evidence obtained by its game census in that year, and thus bears out the conclusion, based on similar evidence, that the number killed in 1919, when does were permitted to be shot, was in excess of 20,000.

In the course of its study of the operation of the buck law, the Commission during two successive years made a careful estimate of the total deer population of the State. This estimate was based on the weekly observations of the protectors, and also upon examination of the deer yards in the winter. This is the only instance in which the Commission has attempted to ascertain the total number of a species in the State, or, in other words, the actual amount of the capital stock. In the case of the deer, the estimate showed in round numbers approximately 50,000. The



WAS THAT THE CLICK OF A TRIGGER, OR ONLY A CAMERA?

number reported killed in 1918 is thus about sixteen per cent of the total stock. The total kill was actually more than this, because some hunters failed to report, and there was in addition a considerable illegal kill. After making a reasonable allowance for all of these uncertain factors, it seems clear that in 1918 and other similar years, when the number of deer killed legally was between 8,000 and 10,000, the herd was standing all of the annual drain of which it was capable. The accuracy of this conclusion is borne out by the fact that prior to 1919 deer were practically holding their own, without appreciable increase or decrease. In 1919, however, when deer were killed, and over

20,000 deer were legally shot, and the usual number illegally, the capital stock was reduced far more than the normal increase for that year, with visible effect upon the supply.

Cottontail Rabbits. While the cottontail rabbit heads the list numerically, he is exceeded in value by the muskrat, skunk, and deer, and is closely approached in value by the ducks.

The table of distribution of the cottontail rabbit shows that Erie, Steuben, Onondaga and Orange Counties lead in numbers with more than 20,000 credited to hunters in each of those counties. This does not mean that more than 80,000 rabbits were shot within the actual confines of those counties; but inasmuch as hunters do not go far afield for the cottontail, it nevertheless gives us a fairly accurate picture of the relative distribution of the cottontail. This is borne out by the fact that Hamilton County reported only 284. Here again, however, we must take into consideration the fact that the tables must be interpreted in the light of the total number of hunters in the section. In all of the counties which contain large cities, or are adjacent to them, there will be many hunters, whereas in a sparsely populated county like Hamilton, there will be relatively few. Accordingly, from year to year, as the statistics are analyzed and interpreted, it will be necessary to watch the increase or decrease in numbers of each species taken, and to study the results in connection with the total number of licensed hunters in that locality. If the statistical investigations are then supplemented by systematic studies in the field, it will be possible to detect and check any tendency toward over-shooting, and to devise methods for substantial increases in the stock.

Squirrels. In view of the fact that frequent efforts are made, chiefly by persons actuated by sentiment, to have all hunting of squirrels prohibited, it is significant that the total number of grey, black and fox squirrels taken in 1918 was not less than 134,478. While they must be carefully watched from year to year, it is nevertheless clearly apparent on the basis of these figures that they are far more abundant than we had before imagined. The tables of distribution of black and fox squirrels show that they enter into the calculations of hunters far more

extensively than ever before realized, hunters from 60 counties reporting that they took black squirrels, while hunters from 59 counties reported fox squirrels. Black squirrels are chiefly important to hunters in the southwestern part of the State, Cattaraugus leading with a report of 2,485. Their number decreases toward the north and east, Clinton and Rensselaer counties reporting only one each. The distribution of the fox squirrel is some-



THIS WILD GROUSE THOUGHT THE TRACTOR WAS DRUMMING FOR A MATE.

what erratic, the greatest number being reported in the central, southern and western counties. It is probable, however, that the counties reporting a small number actually have none within their borders, and that hunters who took out their licenses in those counties shot them in other counties. There is also a possibility of mistaken identity in the case of the fox squirrel, which may account for the large number reported from some counties where we have not believed that they existed.

Grouse. Every grouse hunter who believed that the grouse was nearly exterminated during the last few years, will be surprised

and gratified that the number reported killed in 1918, before the birds had recovered from their decrease, was 41,757, indicating an unsuspected reserve stock. The rebound which these birds exhibited in 1919 and 1920, which is well known to every close observer, is further confirmation of the fact that the grouse were not so close to the line of extermination as we had imagined. It is evidence that the wild life of field and wood is actually far more abundant than a casual walk or a few hunting trips will reveal. This is a further argument for careful and systematic field investigation of a subject which does not disclose its secrets readily. The causes of such sudden and marked decreases and increases must be more definitely ascertained, if we are to devise effective methods of control and increase.

Pheasants. Pheasants crowded the grouse closely in numbers, with 35,855 reported. The table thus shows that this game bird, which has been artificially introduced as the result of the work of the State game farms, is now as thoroughly established as the grouse. In fact, if we consider that the open season on pheasants is only four days long, it is clear that this bird yields more results per day of hunting than does the grouse.

In 1918 the output of the State game farms was 59,318 eggs and 11,415 half grown birds. Only about thirty-five per cent of the eggs are successfully hatched by the applicants and the birds reared to the age of liberation. It is thus apparent that in 1918 the game farms were responsible for the liberation of not more than 33,000 pheasants. This was the banner year for the farms up to that time. One-half of these birds, however, were cocks and one-half were hens. As the law permits only cock birds to be shot, it is thus clear that in 1918 the hunters killed more than twice as many cock pheasants as the game farms had ever produced in any single year. We thus have here incontrovertible statistical proof that the game farms are fulfilling their mission, and are stocking the State with a game bird which is breeding abundantly in the wild state.

Woodcock. The Commission has made two investigations of the condition of woodcock, through its game protectors, at the request of the United States Biological Survey. The last of these was in 1920. In accordance with the request of the Biological

Survey, one of the questions upon which the game protectors reported was the estimated number of woodcock killed in their districts in the season of 1919. The total of their reports showed 16,262. The season of 1919 was not essentially different from that of 1918. It is accordingly significant that whereas the protectors estimated 16,262 in 1919, the hunters reported that in 1918 they shot 19,249. This would have been somewhat larger if all hunters had reported. In making reports involving estimates, the protectors are almost universally found to be very conservative and to hesitate to express anything not based upon ascertainable fact. This is the natural result of their training in handling cases in court, where evidence must be conclusive.



GAME PROTECTORS TEACH THE YOUNG IDEA TO
HELP WILD LIFE.

It shows that statements made by protectors regarding game conditions can be relied upon for conservative understatement, which is always the safest side in matters of this sort.

The report of 19,249 woodcock proves that this bird has not approached so near the vanishing point in New York State as many people have believed. Reports of subsequent years will now indicate more clearly whether he is going up or down the scale.

Quail. Inasmuch as the only locality in which quail may be shot is Long Island, a total of 8,999 quail reported is somewhat impressive. The hunters of Suffolk County led with 4,496; Kings

followed with 1,187, Nassau with 1,176, and New York County with 1,091. Hunters of forty-five other counties, however, took quail in that year. The point where a hunter buys his license is not in all instances the place of his residence, nor where he does the most of his hunting. It nevertheless is some indication



HIS SKIN IS WORTH \$25.00 IN A GOOD YEAR.

of residence when a large number of hunters is considered. Accordingly, the fact that reports of quail come from forty-five counties, scattered all over the State, is clear evidence that wild life in one part of the State is of real value to residents in a part far distant. It is proof again, if any is needed, that protective laws are a benefit to the whole people.

Ducks, Geese and Brant. Water-

fowl are of most importance to hunters in Long Island and adjacent counties, to those in the central part of the State, where the Finger Lakes are located, and in the counties bordering on Lakes Erie and Ontario and the St. Lawrence River. Suffolk leads with 25,654 ducks, 375 geese, and 81 brant credited to sportsmen who were licensed in that county. New York County reported 10,664 ducks, 238 geese, and 60 brant.

As the Federal Migratory Bird Law becomes increasingly effective, the annual bag of waterfowl should very materially increase.

One of the interesting facts developed from study of the tables is the close connection between the dense centers of population and large reported bags of game. It is evidence that the wild life of the woods and fields and waters is quite as much a factor for the city sportsman as for the man living in rural sections. This is particularly true in the case of waterfowl.

Shore Birds. The distribution of shore birds among hunters closely parallels that of the ducks, geese and brant, the greatest number being reported by hunters licensed in counties on or adjacent to Long Island, in the Finger Lakes region, and along the Erie, Ontario and St. Lawrence shores.

The Commission believes that the report of 1,214 golden plover indicates a confusion in the minds of sportsmen regarding the identity of this bird. The golden plover winters in South America, migrates north up the Mississippi valley in the spring, swings east to New Brunswick and Nova Scotia, and in the fall returns over the ocean to South America. Dr. J. T. Nichols, Associate Curator of the American Museum of Natural History, who is undoubtedly the foremost authority on shore birds, says that:

“There is no doubt that in the course of years shore birds, as a whole, have fallen off greatly in numbers; but along favorite migration routes, such as the meadows which, on Long Island, lie between the outer sand beach and the bays which it shuts off from the ocean, they still are fairly plentiful. It is noticeable that the decrease in some species has been very marked, whereas others are holding their own rather well. The dowitcher and krierer are very much fewer than they were, the golden plover now occurs only as a straggler, the Eskimo curlew is gone. * * * It is my opinion that if any species deserves complete protection, it is the fast disappearing golden plover.”

A species so near the vanishing point should be entirely protected.

Fur Bearing Animals. Reports of fur bearing animals are particularly enlightening in connection with statistics supplied by the New York State Fur Merchants' Association for the season of 1917 and 1918. The Fur Merchants' Association estimated that the State produced in that season 50 fishers, 35 otters, and 35 sable, whereas the reports show 396 fishers, 591 otters, and 823

sable. They are thus far more important in the State than the Commission had believed, and the difference is doubtless accounted for by the fact that many furs taken in New York are shipped direct to fur buyers in St. Louis and elsewhere.

The total value of the fur crop bulks impressively, showing a valuation in 1918 of \$1,567,259. It shows that in actual cash value the fur bearing animals are as important a factor as those that are taken for sport or food only.



THE CAPITALIZED VALUE OF FUR BEARERS RUNS INTO MILLIONS.

Muskrats. The total number of muskrats reported, which was only 62 less than 400,000, furnishes cause for the greatest concern over the future of these animals, if such a rate of trapping should continue for many years. It is difficult to believe, on the basis of such a report and of such evidence as has reached the Commission from the game protectors, that these animals could long withstand such a drain. As a matter of fact, they probably will not be subjected to it, because of a fall in the price of fur. Such an enormous number taken in one year, however, proves the necessity for most careful field study to determine whether the annual increase is being overtrapped or not. In that year, at a

conservative valuation of \$1.50 per skin, the muskrats were worth approximately \$600,000. We cannot afford, when such values are at stake, to work in the dark, as we must necessarily do to a large extent, when provision is not made for systematic field work in connection with such office studies as this.

Bears. The report on bears killed shows a total of 189. It is probable that the actual number was somewhat in excess of this. The table of distribution shows that none of the hunters who took out their licenses in Cattaraugus County reported that they had killed bears. In that county, however, there is much forest land, constituting part of the Allegany Highlands, which in Pennsylvania provide very good bear hunting. A special investigation of the prevalence of bears in Cattaraugus County has been made, and the Commission has dependable evidence that the tracks of bears are fairly common in certain towns of the county, and that bears are frequently killed there. A copy of a sworn deposition filed with the Commission by Mr. Jack Davis of Quaker Run, Town of Elko, Cattaraugus County, states that he has seen in the past four years, sixteen bears, nine alive and seven that were killed, in the towns of Elko and Redhouse in that county. Discrepancies of this sort in the report of the kill of any species of game will become less frequent as hunters take a deeper interest in the compilation of this data. Such errors as exist, however, are on the side of conservatism.

Upon analyzing the reports of hunters, it is apparent that the bears killed have been quite evenly distributed among hunters in all parts of the State, most of whom took their bears in the deer hunting season. It is thus clear that the possibility of getting a bear is very real, and the bear is certainly entitled to an important place in the hunter's scheme of things. Most hunters of course take out their licenses in the counties in which they reside, though there are exceptions to this. The list of counties in which the license stubs show bears killed is thus very interesting as indicating the wide distribution of the men who were fortunate enough to get one. It shows forty-one counties in which hunters took credit for bears.

Jefferson County leads with fifteen, Franklin follows with twelve, and Oswego reports eleven. Of the other Adirondack

counties, Oneida and St. Lawrence reported nine each, Essex and Hamilton eight each, Lewis seven, Fulton and Herkimer six each, and Clinton and Warren five each.

The Catskill counties maintain their reputation as bear country by reporting seven from Greene, six from Broome, and eight from Delaware. Sullivan, however, had only three.

New York reported eight, Onondaga seven, and Erie four. The balance of the forty-one counties reported from one to three each.

When this distribution table is studied in the light of known facts regarding the distribution of bears, it shows that the largest number were reported by hunters licensed in the counties where the most bears are found, but that large centers of population took a considerable toll.

The observation record of the black bear on our biological report cards is practically negligible. This is in strong contrast to the observation record of deer, which constitutes the most important part of the entire system of running re-



SHOT IN CATTARAUGUS COUNTY IN
1920.

ports. The reason for this is of course to be found in the fact that the bear is numerically very much less common than the deer, and is moreover much harder to observe. The bear's senses appear to be so much more alert, and he comes so little into the open that it is only upon very rare occasions that actual sight of one is obtained. Moreover, in ordinary seasons, when there are not many beechnuts, the bears den up very early, and they are accordingly not in evidence throughout the winter, as are the deer.

In addition, it is necessary to take into consideration the fact that bears are great rovers, ranging very far in search of food. Thus they will be found in considerable abundance in one locality for a time, and will then almost entirely disappear, possibly not coming back to that locality in the same numbers for several years.

In 1917 Inspector Nichols of the Eastern Adirondack Division reported that fifty-three bears were killed in his division during the deer hunting season, and two more after the season closed, making a total of fifty-five. Fifteen of these were killed in the town of Indian Lake alone. There seemed to be an unusual influx of bears into the neighborhood of Indian Lake in 1917.

On account of these peculiarities of bears, it is very unsafe to predicate general conclusions upon evidence that is localized or that covers a short period of time. For dependable information the bear country must be considered as a whole, and studied over a period of years.

While it has not been possible to accumulate definite statistical proof, the Commission is nevertheless satisfied, as a result of many years study of bears, and of the general hunting conditions in the Adirondacks, that the black bear is really threatened with extermination in the Adirondacks, unless some steps are taken for his protection. It seems impossible to throw 60,000 hunters into the woods in the deer hunting season, as was done in 1919, with the probability that the number will be increased in years to come, without very seriously threatening the existence of an animal that is no more numerous and is so highly prized as a trophy.

Beaver. In October, 1920, reports were received from the forest rangers in the Adirondacks on the beaver. Instructions had been sent out to the rangers earlier in the season directing them to report on all beaver dams within their district. Similar reports had been requested in 1919, and the men were directed to report this year only on new dams or dams which had been overlooked the previous year.

The report for 1919 summarized the beaver damage for a period of years. The contrast in last year's and this year's report is notable, because the 1920 report includes almost entirely dams less than a year old. The total number of dams reported is only 159, as against 587 reported in 1919. The total area flooded



THE SHORE LINE OF MANY BEAUTIFUL LAKES IS RUINED BY BEAVER.

in 1920 is 1,070 acres against 8,681 acres in 1919. The total value of timber flooded in 1920 is \$3,410, an average of \$22 per dam, as against \$51,425, an average of \$90 per dam in 1919. This is all new damage, in addition to that reported a year ago.

It is notable also that the possible salvage of timber by immediately destroying the dams is \$986, or 26 per cent of the total timber flooded, as against \$5,530, or about 10 per cent of the total timber flooded in 1919. The new areas have been flooded for a few months only, and the timber may still be saved.

It is evident from the above figures, that the beaver are exceedingly active and that they are becoming more and more of a nuisance in the Adirondacks. The damage done by them is increasing every year at an alarming rate, and something should be done to prevent such a wanton destruction of fine timber and beautiful shore lines.

BUREAU OF INLAND FISHERIES

Receipts. The receipts of the Bureau of Inland Fisheries from the sale of licenses to use nets, traps and set lines in the waters of the State for the fiscal year ending June 30, 1920, were \$30,263.69. This is an increase over the preceding year of \$4,141.12, and is in a measure attributable to the increased vigilance of the game protectors, made possible by the introduction of gasoline launches on our larger lakes and streams.

Catch of Fish. The total catch of fish reported taken by the licensed net fishermen in the past year was 6,613,881 pounds, and the total value of these fish was \$638,126.98. The prices received by the fishermen for their product averaged slightly more than ten cents per pound. While the average price has risen from five cents in 1915 to ten cents in 1919, an advance of 100 per cent, the Commission's schedule of prices for net licenses has remained the same. The money paid into the State treasury in license fees at the present time represents only a fraction of the return to the fishermen from the operation of the nets. In 1919 the fees collected from the fishermen were less than 5 per cent of the money they realized from the sale of the fish taken.

Hudson River. Many of the more experienced shad fishermen along the Hudson river are of the opinion that the yearly

depreciation in the catches of the shad was partly attributable to the fish not having free access to the natural spawning beds in the river above Verplanck's Point, being cut off by the labyrinth of nets placed in the lower reaches of the river, and that some action planned to improve conditions should be taken by the State. The Commission, sharing this opinion, accordingly adopted a rule causing all nets to be removed from the river



BUOYS TO MARK THE HUDSON RIVER SHAD REFUGE.

between sunset Friday night and sunrise Monday morning during the season when the shad are running. The Superintendent of Inland Fisheries has kept a record of the shad taken in the river above and below Verplanck's Point, having in mind the securing of data which would tend to prove whether or not the ruling was in any way acting to better conditions. Shortly thereafter, as it was hoped, and as data collected indicated, large schools of shad found their way to the upper parts of the river and were there taken, while formerly the major catches were made in the vicinity of Verplanck's Point.

The shad taken from the Hudson river during the season of 1919 exceeded in numbers the yield from these waters in any season during the past ten years. It is hoped that the unaccounted for return of the shad in large numbers during the past three years is not a flash, but an indication that these fish will return in increased numbers until they are again plentiful and occupy the conspicuous place that they formerly did in the markets of the state.

For years the catch of shad from the Hudson river had been diminishing, until in the year 1915 it reached its lowest level, but 24,209 pounds being reported. Subsequent to 1915 the catches began to increase, 25,206 pounds being taken in 1916, and 29,045 pounds in 1917. In 1918 a big jump was taken, the catch of this season showing an increase of more than 100,000 pounds over the preceding year. In 1919 a still further increase was shown. In that year 257,826 pounds were taken, an increase over the catch of 1918 of approximately 13 per cent. In the year 1915 the Commission issued 777 licenses for use in the waters of the Hudson river, while in 1919 there were 1706 such licenses issued.

The figures given above are from reports turned in to the Conservation Commission by licensed net fishermen. More complete statistics have, however, been obtained each year by a statistician of the United States Bureau of Fisheries, who has spent much time after the close of each fishing season on the river, interviewing the fishermen and getting direct reports of catches from them. In much of this work the Conservation Commission has cooperated by the use of its motorboats and protectors. This statistical investigation gives a much more complete picture of the fluctuation in the catch, since it includes New Jersey as well as New York. While it shows the same gratifying increase in 1918 and 1919, that is reflected in the returns of licensed net fishermen, it nevertheless introduces a disquieting element in 1920, when the number of shad were reduced almost one-half. While some fluctuation is to be expected, it will nevertheless remain for subsequent years to disclose whether the lifting of nets and the setting apart of a shad spawning refuge will become permanently effective in increasing

the number of fish, or whether such remarkable increases as in 1918 and 1919 will continue to remain among the many unexplained phenomena of fish distribution. The table prepared by the Bureau of Fisheries follows:

Shad Fishery of Hudson River, 1915 to 1920

(Prepared by U. S. Bureau of Fisheries in cooperation with the Conservation Commission)

	Number of shad caught	Pounds	Value
1915	15, 855	68, 668	\$8, 643
1916	9, 287	40, 173	5, 465
1917	12, 015	43, 384	6, 540
1918	67, 403	234, 602	48, 184
1919	90, 301	374, 974	83, 724
1920	49, 315	199, 844	56, 309

The carp fisheries, in the year ending December 31, 1919, produced 511,366 pounds, of which about 45 per cent, or 230,-457 pounds, were taken from the Hudson river. The yield from the Hudson river this year shows an increase of 85 per cent over 1915. The carp fisheries comprise the biggest branch of the industry in the Hudson, contributing a larger catch each year than the combined yield of all other fishing in that water excepting the shad.

These fish, to be readily saleable and to bring the highest prices, must be brought to market alive. On the Hudson river every facility for getting the carp to the market in the shortest space of time is available. The prominence of these waters in the carp fisheries of the State is therefore attributable to the geographical location of one of the largest fish markets in the world and to the freedom from difficulty in reaching it.

In addition to the shad and carp, there were taken from the Hudson river by the licensed fishermen bullheads, eels, herring, perch, suckers, frostfish, pike, pickerel, rock bass and sunfish totalling 346,948 pounds.

The commercial value of the fish taken from the Hudson river under licenses issued by this Commission is \$127,601.86. These figures are not estimated, but were furnished by the fishermen and represent the actual amount of money received for their catches

Lake Erie. Lake Erie in 1919 produced more fish for market than did all other fresh waters of the State combined. The total pounds of fish contributed by this lake was 4,335,936, as compared with 3,699,472 pounds in 1918. The commercial value of the fish taken in 1919 was \$288,825.73.

The Burbot Fishery. The market for burbot, sometimes called ling, or lawyer, created in recent years, has been gradually developing, until there now exists a well established and increasing demand for these fish. The burbot fishing in this State is carried on only in the waters of Lakes Erie and Ontario. In 1919 the fishermen reported taking 124,906 pounds. The year previous the catch of these fish from the same waters totalled but 43,131 pounds. Some idea of the increase in the demand for these fish may be obtained from a comparison of the catches during these two years. As the supply of these fish is practically unlimited, and as no more are netted than the needs of the market warrant, the increase therefore accurately reflects the success of the Bureau of Fisheries and this Commission to popularize it.

Set Lines. In 1915 the Commission received numerous requests for permission to leave angling lines unattended in the waters of the State to take certain non-game fish. As the Conservation Law provided that the line or rod must at all times be held in the hand when fishing, the Commission was forced to act unfavorably on these requests. Inasmuch, however, as certain waters might be set aside for the taking of the coarser species, such as bullheads, eels, mullet, etc., by set lines during certain periods of the year, without detriment, the Commission passed a rule providing for the issuing of set line licenses under prescribed conditions and making a nominal charge therefor. The issuing of the licenses has from year to year been gradually increasing, until this year the receipts from this source amounted to \$5,062.

BUREAU OF MARINE FISHERIES

Receipts. The total receipts of the Bureau of Marine Fisheries from all sources for the fiscal year ending June 30, 1920, amounted to \$29,493.72. This is a small decrease from the previous year, and is accounted for by the surrender of a number of leases and franchises for shellfish grounds. We must expect

that a decrease in the annual revenue from the State owned shellfish grounds will continue until the failure of the set of oysters has been overcome on a commercial basis. This subject is more fully discussed on page 32.

Leases and Franchises. During the year 38 perpetual franchises for shellfish grounds were surrendered and 22 leases were assigned back to the State, 10 new leases were executed, and renewals were granted on 5 old leases for a further term of 15 years. At the close of this report, 221 leases and 567 franchises were in force, covering a total acreage of 22,464.3 acres. One hundred and twenty-three sanitary certificates for shellfish grounds were granted, 40 lobster licenses were issued, 34 food fish and 30 menhaden licenses were granted, 114 recordings and 16 surveys made, and 67,324 pieces of imported and domestic game were tagged, during the year.

Sanitary Certificates. Each year the problem of issuing sanitary certificates on State owned oyster grounds is becoming more difficult. In Jamaica bay up to this year oysters have been permitted for sale only during the winter months. This year the Department of Health of New York City has refused to issue permits for the sale of oysters from Jamaica bay unless they have been subjected to a purification process satisfactory to the board. Raritan bay, while not as greatly polluted as Jamaica bay, is now menaced by the proposed discharge of 300,000,000 gallons of sewage a day from the Passaic valley sewer. It is evident that the Commission will not be able to issue sanitary certificates much longer for these beds. It is, therefore, becoming necessary to consider the feasibility of certifying the product instead of certifying the oyster beds as provided for under the Conservation Law.

The important problem before the Commission for the coming year will be to develop a system of purification which will make it possible for the oyster growers to continue the use of beds which have not been certified, by properly treating the oysters so that a certificate of the product can be given under section 313 of the Conservation Law. The law at the present time is not specially written to provide for such a treatment, because it was not generally recognized at the time the law was written. The law does provide, however, for the removal of oysters to unpolluted areas

for the purpose of purification, so that a certificate of the product can be given.

Unless some system of purification is adopted, it will mean that large areas of the best ground for growing market oysters will be removed from propagation. While the State owns the larger portion of these grounds, and will lose practically all the revenues, this factor is a small one compared to the loss in food producing areas which are at the present time in great demand. Moreover, it is believed that the public health will be more thoroughly safeguarded in the future by the adoption of a process whereby oysters can be guaranteed as free from infective organisms than has been possible in the past without such a means of purification. This subject is more completely discussed on page 41.

Surveys. The State boats "Rednav" and "Shellfish" have been in continuous commission during the entire season, performing the necessary and important work of this bureau, making surveys and erecting signals.

During September a hydrographic signal was erected over the U. S. Coast and Geodetic Survey Station, "St. Johnland Pole," at Kings Park, L. I., the pole over this point having fallen over. The signal is a regular galvanized angle windmill frame, having the top boarded so as to be seen from a distance.

An application made by A. J. Beatty for a lease for shellfish lands in the vicinity of City Island, N. Y. during July was cancelled, as upon examination of the ground it was found to contain a bed of natural growth oysters.

Two new survey stations, "Outlet" and "Sewer," were determined by triangulation for the survey of shellfish grounds in the East river in the vicinity of Throggs Neck, N. Y.

During October a triangulation survey of the Hudson river in the vicinity of Yonkers, N. Y. was commenced, but owing to inclement weather this survey was postponed for a later date.

The other surveys not included in the appended list were made at Kingston, N. Y. and Southold, L. I. The survey at Kingston was made to determine the geographical positions of the buoys set by the Conservation Commission to mark the boundaries of the shad spawning area in the Hudson river, from Kingston to

Barrytown. The Southold survey was made at the request of the Attorney-General's office to determine the location of three lots in Southold Bay.

Assistance was also given during the year in connection with the sanitary surveys made by the U. S. Bureau of Chemistry.

BUREAU OF FISH CULTURE

The activities of the Bureau of Fish Culture consist largely in the conduct of fishcultural operations, including the conservation



WINTER FISHING REQUIRES PLENTY OF ENERGY.

of eggs collected at commercial fisheries; the operation of all fishcultural stations and the distribution of their product; the assignment of fish as to species upon all applications; the investigation of waters to determine the best policy to pursue in order to improve fishing conditions; supplying live fish for various exhibits and the maintenance and operation of live fish exhibits

at the Rochester Exposition and the State Fair at Syracuse; and the conduct of a vast amount of correspondence in answer to every conceivable inquiry relative to fishes, fishing and fish propagation.

During the year there were operated twelve hatcheries, the canal ponds at Fort Hunter and Schuylerville and the newly established field station for rearing trout fingerlings at Summitville.

A comparison of results in fish production for the past five years reveals that the past season's production has exceeded all others by 38.6 per cent, the total number of fish distributed amounting to 749,941,667.

Owing to the excessive cost of labor and material resulting from the World War it is useless to attempt to compare the cost of operating the hatcheries during the past year with years preceding the war, but a comparison of man power during the last year with the fiscal year 1915-16 shows that the great increase was made with only 1.4 per cent increase in man power. This percentage of increase in man power was obtained by computing the number of days labor shown by the payrolls for the fiscal year 1915-16 as compared with the number of days labor recorded for the fiscal year 1919-1920. During the past year the Commission has operated for the first time a trout rearing station. In addition to this, the canal ponds and one hatchery more than was in operation during the year 1915-16 were in operation. The slight increase in percentage of man power was necessitated by the operation of these three new stations.

By operating the hatcheries with a minimum number of men and an increased efficiency in service and hatchery methods, it has been possible to increase the wages of the deserving employees and thus prevent the desertion of the more experienced and valuable men to more lucrative positions.

Out of the total production, 85 per cent was the result of conservation of eggs of commercial fishes, the product of which was devoted to replenishing the fisheries of Lakes Erie and Ontario and the marine fisheries about the coast of Long Island. The portion planted in the Great Lakes amounted to 36 per cent and

the other 49 per cent went to the development of the marine fisheries.

The balance of 15 per cent consisted of both food and game fishes, many of which were reared to fingerlings of larger size than it has been customary heretofore to produce.

Physical Condition of the Hatcheries. A change in the method of caring for the physical condition of the hatcheries, which was made in 1917, has made it possible to bring them to a higher condition of efficiency than ever before attained. Prior to that time the physical condition of each hatchery was looked after by its foreman, with such advice and approval as he might receive from the fish culturist. As a result there was no uniformity in the method of upkeep, and many of the hatcheries had deteriorated to a point where radical repairs were vitally necessary. This run-down condition of the hatcheries was clearly brought out in previous reports.

In 1916 a field superintendent, authorized by the Legislature, was placed in entire charge of construction and repairs at the hatcheries. All work of this sort has since been done under his direct personal supervision, with close cooperation from the purchasing department. This has meant that it has been possible to bring about a uniformly high standard of physical condition with very marked economies. Hatcheries which would gradually have deteriorated until their reconstruction or abandonment would have been necessary have been saved for many years of usefulness. What is equally important, the improved condition of the hatcheries and equipment has been reflected in the increased total annual output of fish.

Work of this nature still remains to be done. In fact the maintenance of twelve fish hatcheries, two sets of canal ponds, and a field station, located in fifteen widely separated parts of the State, will necessitate at all times the supervision of a field superintendent, if these valuable properties are not to deteriorate, and if their upkeep is to be handled in the most efficient and economical manner. Some of this additional work, for which the field superintendent is already making plans, will still further increase the capacity of some of the hatcheries.

Canal Ponds. The canal ponds were placed in commission when this country was actively at war and when it was almost impossible to secure any kind of labor for completing necessary constructions.

After the canal had been partitioned and outlet drains constructed at the locks, it was discovered that the bed of the canal had many depressions in it which could not be drained. Efforts to eradicate the animal life in these depressions by seining proved futile. Some work has been done each year since the establish-



SMELT FISHING IS AN IMPORTANT WINTER INDUSTRY ON LAKE CHAMPLAIN.

ment of the ponds three years ago, until now practically all of them are capable of being thoroughly drained, and, with a small amount of additional work at Schuylerville, the ponds may be regarded as being completed. To illustrate some of the adverse conditions which it has been necessary to cope with, when some side outlets were constructed during the past season to drain certain depressions in the canal system at Schuylerville, various species of fish, including carp eighteen to twenty inches in length, were liberated. These fish, particularly the carp, had been able to elude seines which had been drawn through the ponds at least twelve times during the past three years, and that, too, when the water was drawn to a minimum.

Reviewing the fish cultural conditions of the ponds during the past season, it may be said to begin with that throughout the

country the seasonal conditions appeared to be adverse to natural reproduction of the nest building fishes. This statement is based upon a bulletin of the U. S. Bureau of Fisheries. Early in the season there was a warm period during a very short time, which brought the fish upon the nests; then there was a long, backward cold season resulting in a very small hatch. This condition, together with the presence of various enemies in the ponds, accounts for a comparatively small production at Schuylerville, although the fish which were produced ranged in length from two to nearly four inches, and production compares favorably with that of the long established and permanently manned plant at Ogdensburgh.

At Fort Hunter one large section was rendered useless for fish cultural operations, due to the fact that the Department of Public Works, in connection with quarry operations, had dumped great quantities of stone into the section, making its use and drainage impracticable. This happened after the section had been for the first time arranged so that it could be completely drained, and it put out of commission about one-half of the system. The other main section of the canal ponds at Fort Hunter was drained and cleared of natural enemies to the bass and then stocked with 50,000 fry from the Oneida hatchery. Owing to the fact that constructions and drainage were not completed until a short time before it was necessary to ship the fry, it was not possible to fill the pond until a short time before the introduction of the fry, and as a result there appears to have been a lack of the normal amount of minute food upon which these fry feed. The total result of the harvest from this 50,000 fry was 14,100 fingerlings, ranging in length from 2 inches to $3\frac{3}{4}$ inches. Specialists in pond culture regard this percentage as good, but it is believed that another season, with the present knowledge of conditions, this same pond can be made to yield a larger percentage of fingerlings.

Adult bullheads were introduced in the Schoharie Creek Feeder, which supplies the water for the canal ponds at Fort Hunter, but, when the harvest was undertaken, these adults could not be found, and but very few young fish. It is assumed that they were stolen by poachers. As these fish are caught at night more easily than in the day time, it is an easy matter for a certain class of people, who have been in the habit of taking what they can from the

State property along the canal, to steal these fish. Even one of the screens between the ponds was stolen by somebody, presumably for use as a window screen, the netting being quite suitable for the purpose. With the present knowledge of the conditions at Fort Hunter, it seems best to stock the ponds hereafter with fry for rearing to fingerlings, and make no attempt to carry brood fish, because the expense in watching them throughout the year would be prohibitive.

At Schuylerville conditions are quite different and it is now possible to carry brood fish. Not a sufficient number has yet been acquired for stocking all of the approximately four and one-half miles of canal in the Schuylerville section, but it is expected that with the opening of the season next spring, this section will be fully stocked with brood fish.

The productive capacity of these ponds can be made to show much larger figures by distributing fry or very small fingerlings, but, with the experience of the past three years, it seems preferable to defer the harvesting of fish until the cool weather of September and October, when the larger fingerlings, although in less numbers, can be harvested with less harm and be in a condition for transportation and planting without any loss. It was found that in harvesting the fish in mid-summer, when the waters of the ponds were at a high temperature, with no available supply of cool water in which to harden them, the fish were sensitive to transportation for any considerable distance, resulting in considerable loss in transit.

The plant now comprises facilities for breeding fingerling bass, both large mouth and small mouth, and bullheads; and for maintaining a brood stock of these species. Nowhere else does the Commission have these facilities. The demand for all of these species exceeds all past productions, and these new facilities have got to meet these demands.

With the provision for an additional foreman, the work will be placed upon him, instead of being under a number of different men, as in the past. At present none of the foremen are well informed upon this branch of fish culture and the new foreman must learn to master the new problems which confront him. The knowledge obtained by the desultory operation of the ponds dur-

ing the past three years has been supplemented by the work of the Special Investigator in Fish Culture during the past season.

Summitville Field Station. The Summitville field station was established in the spring of 1920, as provided for by legislative appropriation. It consists of 48 standard hatching troughs set up out of doors, the arrangement of the troughs being identical with that of similar equipment in a hatchery, and it is capable of being transferred to a hatchery interior in case it should be so



THE SUMMITVILLE FIELD STATION.

desired. The troughs are completely covered for the purpose of excluding vermin, as well as to prevent the young fish from leaping out.

The water supply is from an adjacent rivulet about a mile in length, made up of springs all the way from its source to the point where it is conducted to the troughs. During the months of August and first half of September the normal flow from the springs was 720 gallons per minute, with a mean temperature of 56 degrees Fahrenheit. The amount of rainfall during this period was probably somewhat above normal, but even with a subnormal rainfall, it is believed that with increased rearing facilities sufficient water would be available. The vegetation in and along the banks of the stream is teeming with shrimp, a very desirable food

for trout, and adult trout resort to this stream in autumn during their spawning season.

The capacity of the present plant is about 250,000 fry, the distribution of which begins when the fish are about 2 inches long. The thinning process by distribution then continues until the close of the season in early October, when the last of the fish are about 4 inches in length.

The object of this station is to have a place to which fry from congested hatcheries may be transferred and reared. The location is about one-fourth of a mile from the railroad junction at Summitville, on seven acres of land with water rights, owned by and leased from Mrs. Nial Williams. It was selected with a view to rearing the fish in a zone of fish distribution not accessible from the hatcheries without a long haul. It is possible to transport fry from several hatcheries at the rate of about 75,000 per messenger trip, or to stock the plant in three or four messenger trips. To distribute the product in fingerlings requires fifteen to thirty messenger trips of twenty cans each.

From this station there is a demand for its entire production within three or four hours' journey and much of the work is accomplished by the use of a light truck. Many of the fish are delivered to applicants who call at the plant for them.

Live Fish Exhibits. Because of a very popular demand as well as of the educational value of live fish exhibits, it has become the policy of the Commission to supply live fish for exhibit at County Fairs and to State and Municipal schools, but the Commission does not provide aquaria in which to keep the fish.

The Rochester Exposition and the State Fair are provided with aquaria owned and maintained by the State and the annual exhibits at both Rochester and Syracuse are provided and maintained very largely at the expense of the Commission.

At Rochester, the aquarium installation, being of recent construction, is well equipped and advantageously placed both for the public and for convenience in manipulation. The tanks used in this installation were originally constructed for the Pan American Pacific Exposition in California and afterward purchased by the State.

At the State Fair the aquarium installation is inadequate, inconvenient for manipulation by attendants, and badly arranged for handling the vast throngs which attempt to see the fishes. The water supply on the occasion of the last exhibit was of adequate volume and steady pressure, a great improvement over the conditions at previous fairs. It is believed that the water supply would be greatly improved if a change could be made whereby the city reservoir, which has its source in Skaneateles Lake, could be used instead of the older city water supply, which it is understood is now used.

Restocking Waters in the Adirondacks. In the Adirondack Reservation are innumerable waters to which campers and fishermen resort during the open season, some of which are fished hard. However there being no residents in the immediate vicinity, or none who are personally interested in this particular branch of conservation, the waters are not regularly stocked and many of them never restocked with fish. The present fish cultural facilities are taxed to provide an adequate supply of fish for which formal applications are received.

A remedy for this condition is suggested by increasing the productive capacity to the limit of the water supply, of the few hatcheries which have possibilities in that direction, and the establishment of additional hatcheries or field stations similar to the one at Summitville.

If the funds are appropriated for new pipe lines and a pumping plant at the Adirondack (Saranac) hatchery, the improvement should make it possible to materially increase the production of fingerling trout. Provision for permanent improvement to the water supply at the Bath Hatchery will make it possible to materially increase the production of fingerling brook trout.

With the completion of proposed improvements on the recently acquired land commonly known as the Thistlewaite tract at Old Forge, the production of fingerling trout on a scale comparable with that at other hatcheries should be assured. Such a condition will make it possible to take the aggressive in stocking many waters in that portion of the Adirondack Reservation which naturally falls within the distribution zone of the Old Forge Hatchery. Aside from the possibilities covering the neglected

waters which are within the natural zone of distribution from Old Forge, and which it is hoped can be properly cared for after the rehabilitation of that hatchery, it will in all probability be found most economical to provide for other reservation waters now neglected, by the establishment of field stations similar to the one operated during the past summer at Summitville.

Beaver a Factor in the Depletion of Fish. It is now a well recognized fact that the work of beaver is destroying the fish



THE PASSAGE OF TROUT UPSTREAM TO SPAWNING GROUNDS IS EFFECTIVELY
BLOCKED BY BEAVER DAMS.

productivity of many streams. Occasionally the beaver obstructions create a pond out of a portion of a trout stream, as a result of which, for two to five following years, there is a yield of numerous trout much larger than ordinarily caught before the stream was dammed. The result is similar to that which follows the reservoiring of natural lakes or ponds. For a few years the fish inhabitants find an abnormal amount of food and grow rapidly. Whether the reservoiring is the work of beaver or man, a large area of the pond may be too warm in the summer to be congenial for cold water fishes, and the latter are at such times confined to the spring holes and inlets. The anglers soon learn where the fish are compelled by water temperature to resort, and have good

fishing until the fish are reduced to a minimum. After a few years it often happens that such ponds produce very few trout, but if they contain minnows, chubs or other warm water fishes, the latter become very numerous, consuming the food of the young of the trout as well as the trout eggs and fry.

If sufficient area has been flowed to cause an abnormally high temperature for trout, this high temperature is transmitted to the stream below the dam and renders the latter unfit for trout for its entire length, or to some point below where accessions of colder water restore the natural conditions to a partial degree. There are many streams thus rendered uninhabitable, and when portions of streams are still unaffected, the natural spawning places at the headwaters are rendered inaccessible by the beaver dams.

The Conservation Law prohibits the use of screens and attempts to regulate or facilitate the passage of fish over or by dams, but in a majority of instances the beaver is permitted to do the same things without molestation. The beaver are now so numerous that the Commission feels that some check should be put upon them, in the interest of fish culture, as well as for other reasons.

Investigations in Fish Culture. It seems strange that, notwithstanding the fact that the United States leads all other countries in the production of fish, and that the work has been going on now for over sixty years, there are a great many problems which no one in this or other countries is able to solve or even has attempted to solve. There is no regular, up to date fish pathologist in this country. No one knows positively why it is impossible to produce under given conditions at one hatchery the same amount of fish as it is possible to produce under apparently similar conditions at another hatchery. It is possible to go on and enumerate many other phases of fish cultural problems which often enter into the work of the hatcheries and which are factors in the results obtained from planting fish in streams, ponds and lakes.

During the past year this Commission has undertaken an investigation, the nature of which differs from any ever before undertaken, in the biological survey of Lake George. In this work special investigations as to the relations of plant growth to fish food were made which have suggested the importance of more extended investigations along similar lines in other ponds and lakes

where the fish cultural results have not been as satisfactory as could be desired. There is a field of work for an investigator in fish culture of great economic importance, and for this reason it is hoped that the work can be permanently provided for, either in the Commission or at Cornell University, where laboratory facilities and scientific supervision are already available.

Some suggestions as to the scope of the work which should be undertaken may be summarized as follows:

1. Food relations of the fishes of New York State including food, game and bait fishes.
 - (a) Direct sources of food through the entire year and life cycle.
 - (b) The indirect or primary sources of food.
 - (c) The conditions of plant growth which give the best returns in pond culture and practical methods of control.
2. Habits of fish under cultural vs. natural conditions.
 - (a) Foraging grounds of fingerlings and adults.
 - (b) Spawning and nesting.
3. Enemies and competitors.
4. Pathology.
 - (a) Parasitism.
 - (b) Disease, comparative studies in different waters on susceptibility to disease by water molds, or fungi in:
 - (1) Egg and fry stages.
 - (2) Fingerling and adult stages.
 - (c) Water molds in general in fish cultural waters.
5. Pollutational conditions.
 - (a) Effects of pollution on the flora and fauna of fish cultural waters.
 - (b) Effects on food relations.
 - (c) Resistance and susceptibility of fish to disease.
6. Investigation of water sources used for hatchery purposes in:
 - (a) Artificial culture of fish.
 - (b) Pond culture of fish.
7. Biological surveys.
8. Intensive studies of certain phases of the field problems under adequate laboratory conditions.

Lake George Survey. By an act of the legislature of 1920 (chapter 909) the Conservation Commission was authorized and directed to make a biological survey of the waters of Lake George for the purpose of determining the most practical methods of increasing fish production. For the purpose of carrying out the provisions of this act, the sum of \$2,000 was appropriated.

In the fulfillment of this act arrangements were made with Professor J. G. Needham, of Cornell University, to assume charge of the investigations, and the results have been embodied in reports as follows:

A Biological Reconnaissance of Lake George

By JAMES G. NEEDHAM

Limnological Observations of Lake George

By CHANCEY JUDAY,

Of the Wisconsin Geological and Natural History Survey, and the leading authority upon the line of investigation made by him.

The Primary Sources of Food of the Principal Food, Game and Bait Fishes in Lake George

By EMMELINE MOORE, Phd.

Dr. Moore has performed similar work for the United States Bureau of Fisheries and is an authority on the subject.

Notes on the Adult Fishes of Lake George and Their Feeding Habits

By C. K. SIBLEY.

Mr. Sibley is a post graduate student at Cornell University, and was assisted by Dr. A. H. Wright, of Cornell University.

Results of the Survey of Lake George and Recommendations

By JOHN W. TITCOMB,

Fish Culturist of the Conservation Commission.

Dr. Needham's report deals with the general biological conditions of the lake, which he finds are favorable to fish life. It gives suggestive figures of the fish food staples on the lake bottoms based upon conclusions in a few places and calls attention to the abundance of bottom fauna and to the remarkable produc-

tivity of the extensive weed beds, which not only furnish food but shelter, and, for some species, favorable spawning places. It suggests that four native species, namely lake trout, small mouth black bass, yellow perch and bullheads are the ones to be fostered and encouraged as being perfectly adapted to the conditions of the lake; that these should be rigidly protected during their respective spawning seasons. While the northern pike is highly prized by some, it is not worthy of propagation or protection because of its voracious fish eating habits. In the recommendations, the need of more information is stressed, secured by a new kind of fish cultural establishment devoted to the study and development of better post hatchery practices.

Mr. Juday's report definitely establishes that there is an abundance of oxygen in the deepest waters (175 feet), and it also shows that the plant organisms which contribute to fish food are quite uniformly distributed at all depths. His findings show that from the point of view of temperature of the water, the quantity of dissolved oxygen and of carbon dioxide, the quantity and vertical distribution of the plankton and the distribution of the organisms in the lake are all favorable for fish production.

The results of the investigation are important because they show that the lake is alive throughout, having no dead or uninhabitable bottom, as is frequently the case in deep water lakes.

Dr. Moore's report presents data on the natural food of the fingerling fish, stressing especially their staples of diet and tracing them to their plant sources in the shore vegetation and in the free floating microscopic plant organisms. Important information is supplied on the "food producers" among the plants of Lake George, and on the food habits of the various animal organisms on which the young fish feed.

The data supplied in this paper forms an important contribution to our knowledge of fish cultural waters and should materially assist in our fish cultural practices.

Mr. Sibley's report is important because it lists for the first time the species of fish which so far as known inhabit the waters. It also gives data upon the food of the adult fishes during the three months period that the investigations were being made and for certain environments.

Mr. Titcomb's report covers the results of nearly three weeks of observation. It includes the view point of anglers and guides. He made investigations of the relative abundance of mature fishes in the lake, and of angling conditions on the principal streams, with especial reference to the number of landlocked salmon in streams where they have been planted for the purpose of stocking the lake. Careful observations were made of the present planting methods of fingerling lake trout by supervising the distribution of two carloads of them. A description is given of the spawning habits of the several species. It was found that there is an abundance of smallmouth bass of all sizes up to 8 or 9 inches in length but that large mature fish are scarce. The report closes with recommendations as follows:—

For the lake trout, more care and revised planting methods under proper supervision by scattering the fish the entire length of the deeper portions of the lake inhabited by this species; limit the number of lures to two on each line.

Since the annual planting of an average of 20,000 landlocked salmon resulted in an average catch of only about ten fish per year, it is recommended that further attempts to establish this species be abandoned until proper provision can be made adjacent to the lake for rearing them from 7 to 10 inches in length, when they are 1 to 1½ years old. By so doing the fish will have been carried by the period in their life history when their habitat is in streams, after which time they naturally descend to the lake. In the State of Maine, to which the landlocked salmon is indigenous, and which is the only state furnishing a source of supply for eggs of this species, it has been demonstrated that it is better to rear the salmon to yearlings and one and one-half year old fish before planting, and the salmon hatcheries of Maine are being equipped with rearing ponds so as to permit the wintering of the largest possible number of fish.

Enforce the observation of the close season for black bass by constant patrol during the spawning season throughout June and July, and shorten the season on black bass to close on or about November 1st. This last recommendation is made because the large mature fish which are the best breeders are caught late in the season after the bass have resorted to their winter quarters.

Owing to the many enemies to be encountered by the lake trout on the spawning beds, which are in comparatively shallow water, it is doubtful if results from natural reproduction are very favorable, but care should be taken to see that the spawning beds are protected against poachers.

In making the last two recommendations, it is realized that the protective force is now very limited and to carry out the recommendations it would be necessary to employ a protector especially for the lake throughout the season.

Owing to the piscivorous habits of the Northern pike, as described in Dr. Needham's report, the close season should be repealed or modified. It is contrary to general practice to afford protection to Northern pike in waters inhabited by lake trout and black bass.

The very general custom among the anglers for game fish to return to the lake unharmed the numerous sunfish and rock bass means that these two inferior species are being encouraged at the expense of the more desirable species and it is therefore suggested that anglers be encouraged to kill the rock bass and sunfish and have them utilized as food if possible, and if not, have them buried in the gardens where they will be of some use as fertilizer.

Most of the guides are conservationists and realize the importance of conserving the fish and observance of the law, but some of them may need some encouragement to inculc the spirit of conservation among their patrons.

Owing to the very general demand for a fish hatchery on Lake George, very thorough investigations were made as to the fish-cultural opportunities, as a result of which the conclusion was reached that the stream which heads in a spring upon the property of W. J. Mooseberger in the town of Caldwell, flowing through the Irish property, which was at one time operated on a small scale as a trout hatchery, offers the most potential opportunities as to water supply. The Irish property was once recommended by the late Dr. Tarleton H. Bean as a desirable location for a fish hatchery. There is not sufficient water on the Irish property to warrant depending upon that site alone for fish-cultural activities, but the stream flowing through the Irish property is aug-

mented throughout its entire length to the lake by springs, and when the stream reaches the lake, about a mile distant from its source, it has a volume of about 500 gallons per minute, as roughly measured under low water conditions on August 27th.

If the State should decide to engage in fishcultural activities at the lake, the property bordering this stream on both sides from its source to the lake should be acquired. The stream is adequate for the construction of many rearing pools. The upper portion could be used for hatching eggs of any species of salmonidae, and if it is desired to engage in pond culture or new fishcultural methods suggested by Dr. Needham's report, the lower end of the stream would be admirable for such purposes. The property through which this stream flows is adjacent to the Fort George Park.

Recommendations. For the inland waters of the State a limit should be placed upon the number of whitefish and pike perch which may be lawfully taken in one day. In the waters to which such a regulation would apply, these two species are caught by angling only. Only limited areas of these waters furnish a habitat congenial to such species and dependence is placed upon fishcultural practices for keeping up the supply. It must not be overlooked, however, that there are limitations as to the number of fish of a given species which can be brought to maturity in any body of water and that this limitation cannot be overcome by increasing the number of fish annually planted.

It is believed that a limit of 12 per person or 20 to a boat will prevent undue depletion.

The spawning period of fishes is dependent upon water temperature, and the date of the spawning function may vary about two or three weeks from one season to another. Experience has demonstrated beyond much doubt that in such important commercial fisheries as have to do with the annual harvest of ciscoes and whitefish, unlimited fishing is permissible during the actual spawning period, provided the spawn of all ripe fish is conserved. On the other hand, if fishing for these species is permitted while the fish are entering the spawning area, but before any considerable proportion of them are ripe, there is a serious depletion of fish

and waste of eggs, without an opportunity to compensate for such depletion and waste by the utilization of the hatcheries.

This suggests the importance of synchronizing the time of issuing licenses with the spawning seasons, both as to the beginning and ending of the fishing season. In this connection it is of especial importance that during the height of the spawning period, and as long thereafter as eggs can be conserved, fishermen should be encouraged to capture as many spawning fish as possible, with a view to the operation of as many nets as can be efficiently covered by spawntakers.

The present law permits the taking of blue pikeperch of any size, at any time, and in any number or quantity, in the Great Lakes and in the Niagara river. On the other hand, the "yellow pike" or walleyed pike, is protected by a size limit and sale from May 10th to March 1st.

It having been determined that the blue pike is a distinct species, averages smaller in size when mature, and has a spawning season somewhat later than that of the yellow pike, it is recommended that a law be enacted regulating the size of blue pike which may be taken and declaring a close season which will protect these fish when they are migrating to their spawning grounds.

In this connection it may be of interest to know that in the Pennsylvania waters of Lake Erie, neither the blue or pikeperch are protected by close season, but on all inland waters both species are protected by a close season extending from the 31st of December to the 30th of June, both dates inclusive.

If recommendations for the protection of the blue pike are adopted there should be a definition of the blue pike in connection with paragraph 17 of section 380 of the Conservation Law.

Distribution of Fish by Species

From January 1, 1920, to December 31, 1920

Bullhead fing.	4,850
Bullhead yr.	1,850
Bullhead adults.	19
Buckeye Shiner fing.	9,500
Shad fry	1,776,279
Frostfish fry	50,000
Whitefish fry	32,123,000
Lake Herring fry	151,250,000
Lake Herring eggs.	14,820,000
Brown Trout adv. fry	100,500
Brown Trout fing.	478,666
Brown Trout adults	7
Steelhead Trout fing.	466
Rainbow Trout adv. fry	12,000
Rainbow Trout fing.	417,682
Rainbow Trout adults	7
Landlocked Salmon fing.	131,037
Lake Trout fry.	138,500
Lake Trout adv. fry.	314,350
Lake Trout fing.	1,199,355
Brook Trout fry.	1,304,500
Brook Trout adv. fry.	727,700
Brook Trout fing.	4,201,374
Brook Trout adults	16
Smelt fry	105,801,000
Maskalonge fry	5,421,720
Maskalonge fing.	187
Crappie fing.	300
Largemouth Bass fing.	15,270
Smallmouth Bass fry	250,000
Smallmouth Bass fing.	127,160
Smallmouth Bass adults.	22
Pikeperch fry	61,370,000
Yellow Perch fry	3,000,000
Yellow Perch fing.	277,000
Tomcod fry	276,081,250
Flatfish fry	75,000,000
Lobster fry	13,536,000
	<hr/>
	749,941,667

DIVISION OF LANDS AND FORESTS

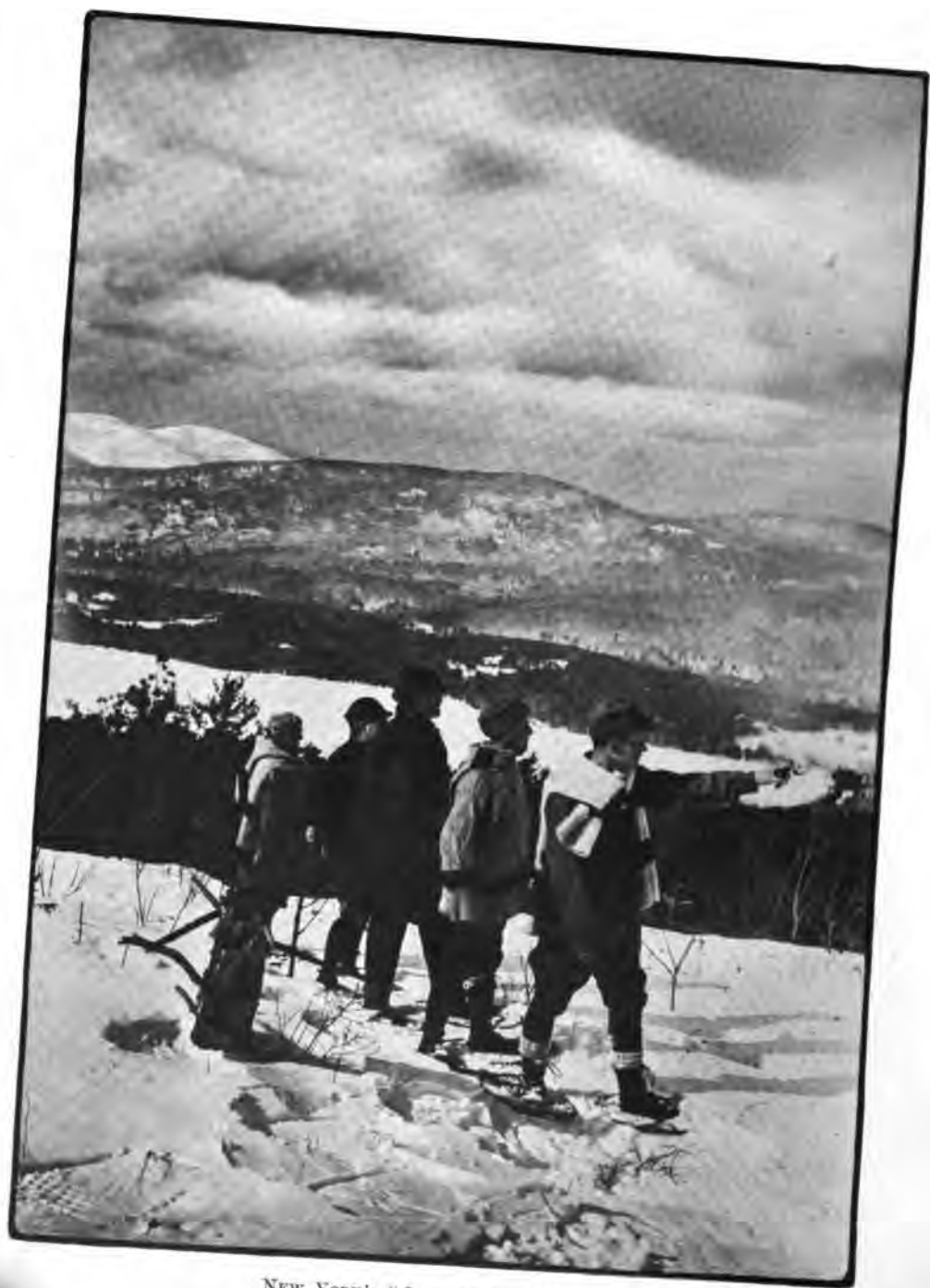
DIVISION OF LANDS AND FORESTS

CLIFFORD R. PETTIS..... *Superintendent of State Forests*
WILLIAM G. HOWARD..... *Assistant Supt. of State Forests*
A. B. STROUGH..... *Land Clerk*
ALBERT H. KING..... *Forester*
ARTHUR S. HOPKINS..... *Forester*
BENSON H. PAUL *Forester*
KARL SCHMITT *Forester*
KINNE F. WILLIAMS *Forester*
A. B. BROOKS *Forester*
WILBUR F. SMITH..... *Chief Land Surveyor*
E. M. MERRILL *Surveyor*
LAWRENCE MCGRATH..... *Examiner of Forest Lands*
A. T. DAVIS..... *Forest Surveyor and Draftsman*
A. F. AMADON..... *Blister Rust Supervisor*

DIVISION OF LANDS AND FORESTS

INTRODUCTION

The past year has been one of marked progress and achievements in forestry matters. The vast forest domain has been protected from trespass and other injury while its extent has been increased by selected and desirable additions; violations of sections of the Conservation Law applicable to this division have been properly settled, or, if it has been found impossible to make such settlement, the matter has been referred to the Attorney-General with authority to bring appropriate actions; the forest ranger force has, in spite of increased wages offered our employees by others, been kept on an efficient basis; the illegal occupancy of the Forest Preserve has been materially reduced; property in our care has been protected and improved; publications of interest have been issued which have met an enormous demand and have brought forth words of appreciation and commendation; the use of the Forest Preserve has been greatly increased and more intensively enjoyed by vacationists and others on account of the improvements which we have made; reforestation of State and private lands has proceeded as labor conditions have permitted; the nurseries for propagating trees have increased in capacity; surveys to locate the boundaries of State land have been conducted and a large amount of this work accomplished; much work has been done in investigation of land titles; the control work of white pine blister rust has been continued, together with experiments and educational work, in order to interest private owners and assist in solving the problems presented. There are other projects, such as the establishment of the practice of forestry on private lands, that should be made possible through necessary legislation. More details as to these various subjects will be found in the following pages.



NEW YORK'S "LAND OF THE SKY."

THE FOREST PRESERVE

This domain has increased in the nearly forty years since the first law setting aside lands for this purpose was passed until now it consists of nearly 2,000,000 acres. This great area of rugged mountains, rolling hills, lake regions, waterways and forest country has functioned as never before. It has been more intensively used and more greatly enjoyed and appreciated by the people of the State than ever before.

Trespass. Our field force has been vigilant in watching the Forest Preserve lands, and thereby it has prevented, to a large extent, trespass thereon and has detected the few cases which were committed. A summary of the trespasses reported as occurring during the present year is as follows:

	Trees cut	Value
Through use by campers.....	17	\$11 25
Cutting of roads	24	15 00
Error in boundary lines	259	169 25
Claim of title	94	40 00
Removal of material	17	8 00
Total	411	\$243 50

The above includes 13 cases, but four of which can be really classed as willful trespasses, and three of these under claim of title and one in the removal of material.

Occupancy. During the past six years efforts have been made to prevent further establishment of occupancy upon the Forest Preserve and to reduce the number of those already upon the property. These cases have been reduced from nearly 1,000 during this period to 164. Of these, 101 cases are in the hands of the Attorney-General with appropriate authority to bring actions; there are 31 other cases in which surveys and other investigations have been made and are practically ready for transmittal to the Attorney-General; in 32 other cases further investigation is necessary to be made, and, in some instances, this will develop the fact that there is no occupancy, but that the ranger has made



STATE LAND ON THE JOHN'S BROOK TRAIL TO MT. MARCY.

a report of occupancy without the information which is ascertained as a result of survey or more thorough investigation into the fact.

Boundary Lines. The Forest Preserve has approximately 9,000 miles of boundary lines. This vast mileage is being reduced through purchases by the consolidation of areas, but still there is an enormous amount of field surveying to be done. Men are being found or being trained who are particularly adapted to this work. A standard form of survey work, monumenting of boundary lines, mapping and keeping of records, in order to obtain the fullest benefit from the expenditure of money, has been established. It is our policy to have this work done correctly and have the monuments set as permanently as possible, and the records and maps kept in form for future use, thus not simply limiting the work to the present needs but giving the results a permanent character.

Reforestation. During the past year approximately 1,250 acres of land in the Forest Preserve have been planted. This, together with similar operations in other years, amounts to 25,500 acres of State land in the Forest Preserve which have been planted, or, in other words, something like one-quarter of the land which the State owns in the Forest Preserve which is in need of reforesting.

Acquisition. There has been less land offered for sale this year than formerly. When purchases were commenced under the bond issue there seemed to have been an accumulation of property which was on the market, but, after the purchase of land during the period covering the last three years, much of this property has been acquired, and the high price of lumber and wood materials has been an incentive to the people to lumber their land rather than sell it. There has, however, been a considerable area of land offered, the most desirable of which has been carefully examined and negotiations have been conducted in regard to the concluding of the purchase of the property. An analysis of the land purchased since the funds under the bond issue became available is as follows:

There has been purchased, title approved and paid for, a total of 121,488.58 acres, at a consideration of \$1,180,860.94. There



SLANT ROCK CAMP ON THE JOHN'S BROOK TRAIL TO MT. MARCY.

are included 97 different acquisitions, at an average of approximately \$9.70 per acre. There are other purchases aggregating 90,607.69 acres, at a contracted price of \$1,000,403.77, which are included in 214 proposals, all of which have been approved for purchase and are now awaiting examination of title by the Attorney-General. The last named purchases average approximately \$11.00 per acre.

There are 26 proposals in which the title has been rejected by the Attorney-General or, for some other reason, rejected, containing 14,365.59 acres. There have been approved, rejected, appropriation 62 proposals of which, in 15 cases including 46,925.30 acres, notices of appropriation have been served upon the reputed owners, and the premises included therein are a part of the Forest Preserve. In the remaining 47 cases, covering 56,755.41 acres, the service of the statutory papers has not been made, and, therefore, the appropriation in these 47 cases has not yet been completed. Agreements to purchase additional lands have been made by this Commission and recommendations either have or will shortly be made to the Commissioners of the Land Office in regard to their acquisition.

The property which has been acquired consists of practically all types of forest land and is situated in nearly every part of the Adirondack and Catskill Parks. Large areas of the great mountainous region with its high elevations and steep slopes have been acquired, in order to insure the continuance of the forest upon these areas and prevent their denudation; to prevent soil erosion; and to insure that a protection forest will be maintained on these areas. In other places, tracts have been acquired which are more accessible and are suitable for various kinds of recreational purposes.

About an equal area of the steep mountainous type and of the lower country has been acquired, but the former has been much more expensive than the latter.

Whenever the tracts which are offered are of size and contain a large amount of timber, they are very carefully examined and forest type maps are made and careful cruises of the timber are obtained. These facts are of importance to the Conservation Commission and to the Commissioners of the Land Office in ascer-



LOOKING WESTWARD FROM THE TOP OF MARCY ACROSS THE GORE AROUND LAKE COLDEN, RECENTLY ACQUIRED FOR THE STATE.

taining the value of the property, and in cases of appropriation will be useful to the Attorney-General in prosecuting the cases before the Court of Claims.

At the end of this report will be found a list of lands which have been finally acquired during the year, either through appropriation, or by purchase with the approval of title by the Attorney-General.

Area. The acreage of the Forest Preserve changes each year. The increases are largely due to purchases. Surveys in some cases indicate an increase and in other cases a decrease. The title to some land is lost through litigation, or, in other cases, the court establishes the fact that the State never had title to the premises. The following is a statement of the area on January 1, 1921:

FOREST PRESERVE AREA

JANUARY 1, 1921

ADIRONDACK PRESERVE:

Area January 1, 1920..... 1,767,778.36

Additions:

Acquisitions 75,019.58

Corrections per surveys, etc. 3,131.38

————— 78,150.96

Losses:

Court decisions 22,892.85

Reclassification * . . . 7,201.87

Surveys, etc. 5,867.55

————— 35,962.27

Net gain 42,188.69

—————
1,809,966.99
=====

* This is State land not acquired for the Forest Preserve. It is held for other purposes.



PRIVATELY OWNED TIMBER ON THE JOHN'S BROOK TRAIL TO MT. MARCY.
WHICH CAN BE SAVED FROM DESTRUCTION ONLY BY STATE ACQUISITION.

CATSKILL PRESERVE:

Area January 1, 1920.....	118,772.51
Additions:	
Acquisition.	7,907.94
Losses:	
Court decisions	155.15
	<hr/>
Net gain	7,752.79
	<hr/>
	126,525.30
	<hr/> <hr/>

SUMMARY

Adirondack Preserve	1,809,966.99
Catskill Preserve	126,525.30
	<hr/>
Total.	1,936,492.29
	<hr/> <hr/>

As a matter of explanation of the above figures, the acquisitions are all through purchase or appropriation. The area of 3,131.38 acres is accounted for by the addition of a gore of land north of the Nobleboro Patent, to which we believe the State has title under original ownership, and also by a small lot in Clinton County. However, about 2,000 acres are due to corrections made as a result of surveys by our engineers. With reference to the areas which are deducted, the largest part is accounted for by the fact that the Appellate Division decided that the appropriation of the so-called "Fisher Tract" was void. This tract embraced 21,904 acres. The court decided that the State never had title to the remainder of the land lost through court decisions. The Attorney-General submitted an opinion that the lands owned by the State above the high water mark of the Hinckley and Delta Reservoirs, both situated in Forest Preserve Counties, were not a part of the Forest Preserve; therefore, acting under this opinion and a similar decision that lands at Cranberry Lake were not part of the Forest Preserve, 7,201 acres have been removed from the list as Forest Preserve land. Corrections as a result of surveys account for 4,713 acres. We have notified the Comptroller of

these changes, in order that the assessment-roll of the State property may likewise be changed and the State relieved of paying expenses upon the property.

Recreational Uses. The fact that the people of the State are the owners of such a valuable asset as is the Forest Preserve has not been as widely appreciated as it should be. Railroads and highways bring the people into our mountain regions and to the civilized parts, but, for the people to have the full enjoyment



HAYSTACK'S SUMMIT, CARVED BY THE ELEMENTS FOR MILLIONS OF YEARS.

of the forest region, it is necessary to supplement this means of communication by trails and similar lines of travel.

The value of good, well-marked trails and suitable camp-sites in the Adirondacks and Catskills, not only for the accommodation of the traveling public, but also for a reduction of the forest fire hazard, has long been realized. Prior to the present year, however, no funds have been available for the Commission to do more than make a beginning of work relating to trails and camping places. Such work has been confined mainly to keeping the trails to the fifty-four fire observation stations in good condition and to facilitating as much as possible the visiting of these stations

by the public. The extended use made of these trails was conclusive as to the necessity for further trails.

Not until this year were funds available for this work. An appropriation of \$2,500 made the beginning possible.

A comprehensive plan was formulated of a system of trails covering the larger part of the Adirondacks and Catskills making



MT. COLDEN FROM LAKE COLDEN, ALL INCLUDED WITHIN THE GORE AROUND LAKE COLDEN.

the back country accessible and availing the use of existing routes of travel. This plan consisted of "trunk line" trails with appropriate branches indicated upon a map as a basis for completion of the plan. The money available limited the amount of work possible; therefore, while the whole plan could not be put into effect in one year much was accomplished under the general plan in different sections.

The plan comprehended making, clearing, improving and marking trails; erection of open camps; and building of fire places.

The work was carefully planned and then executed through the forest ranger force.

It should be borne in mind that there are hundreds of miles of existing trails and old lumber roads which provide access to nearly every part of the Adirondack and Catskill forests. Many of these, however, are not useful for the average person, because of the absence of signs or markings to indicate where they run.



WHITEFACE FROM HAWK ISLAND IN LAKE PLACID.

For that reason, one of the most important parts of the new work has been the proper marking of existing roads and trails where these are suitably located for trunk line routes.

After much discussion it was finally planned to adopt a system of marking the trails which would be at once distinctive and practical for use in the woods. On account of the many "blazed" lines found throughout the forests—lines which have been blazed by trappers, surveyors, lumbermen, and others—it was felt that something different from the usual method of marking a trail by blazing trees with an axe was required in the present instance.

In order to designate these trails in an official and distinctive manner, and at the same time to give a general idea of their direction, it was decided to employ a system of marking trees similar to that used by the State Highway Department in marking telegraph poles along State roads. In the case of trails, however, instead of a colored band around the trees, circular metal discs have been adopted, one disc being placed on each side of the selected tree so that it is visible to a person coming from either direction along the trail. The colors of the discs are red, blue and yellow, respectively, the red discs being used on trails running in a general easterly and westerly direction, the blue discs on north and south trails and the yellow discs on diagonal trails. On the discs are printed the words "Trail Marker," so that there may be no mistaking their purpose.

It is evident that at the beginning of a trail, or at the junction of two trails, additional signs are necessary to denote the destination. For that purpose a uniform design for board signs thirty inches long and seven inches wide has been adopted. Examples of these signs are shown in the accompanying illustration. Besides the names of the points reached by the trail and the distances, there is an arrow showing the direction, and a space on the sign board itself upon which is placed one of the circular metal trail markers with the words "Follow These Markers." The result is a system which is very definite and, provided the markers are properly placed, absolutely "fool proof." During the year about forty miles of trails have been completely marked with sign boards and trail markers.

In addition to the trails which have been thoroughly marked, 229 miles of other trails have been cleared out and roughly marked, so that they are readily useful for one who is equipped with maps or who has a fair knowledge of the country.

There are long distances between existing stopping places in many parts of the woods traversed by roads and trails. In order to accommodate the transient who may be tramping, canoeing or, in some cases, motoring through the woods, open camps have been erected at suitable camp sites. Each camp is constructed of logs according to a design of a typical Adirondack open camp. A bed of boughs is placed inside, and in front of the camp is



UNLESS MANY ADDITIONAL HIGH MOUNTAIN SLOPES ARE ACQUIRED, THIS HAVOC WILL
BE EXTENDED.

erected a large fireplace suitable for cooking and camp-fire purposes. Twenty of these open camps have now been completed during the year and plans are under way to build more during seasons to come.

The increase in camping by motorists during the past few years has been tremendous. Every day during the summer, if one travels through the woods along the Adirondack or Catskill highways, he meets large numbers of automobiles with camp equipment either in the car itself or in a trailer attached to it. Many people are adopting this form of travel through the mountains, partly on account of the pleasure it affords and partly on account of the difficulty in obtaining accommodations at the over-crowded hotels. For the benefit of such people, the Commission has worked out the plan of building fireplaces close to the highways where suitable camp sites are located. At such spots not only have fireplaces been built, but provision has been made for the pitching of a tent and room provided outside the roadway for parking an automobile. Ninety-six of these fireplaces have been built during the past season.

The following table shows the work done in the different districts:

District	Miles trails cleared	Open camps built	Fireplaces built
1. Northeast Adirondacks	27	4	25
2. Southeast Adirondacks	50	7	5
3. Western Adirondacks	60	1	23
4. Southern Adirondacks	59	6	31
5. Catskills	64	2	14
Totals	260	20	96

The fact that the work of the Commission in opening trails and providing camping places is popular and appreciated by the public is attested by the very large number of people who have used the trails and particularly the camp sites. Hardly a night passed during the summer months but practically every fireplace had a camping party gathered around it. The open camps have seldom been vacant.



CLEAN CUTTING OF THIS CHARACTER ON THE HIGH STEEP SLOPES WEST OF MARCY HAS BEEN STOPPED
BY ACQUISITION OF THE GORE AROUND LAKE COLDEN.

It is difficult to estimate the great good that will be accomplished by a consistent development of such a policy for making more available the recreational facilities of our Adirondack and Catskill Parks. The Forest Preserve is the property of the people of the State. It is right that the Commission which has jurisdiction over that Preserve should do everything in its power to make it accessible to the people, and to furnish the necessary facilities for its full and complete enjoyment.

Much other work has been done in removing brush and limbs that obstruct the view of attractive scenes from the highways. In this way the pleasure of travel is increased and the region increases in interest to the traveler.



SIGN BOARDS ERECTED BY THE CONSERVATION COMMISSION TO GUIDE WILDERNESS TRAVELERS.

The series of recreation circulars has been increased by others of a similar nature. The demand has been so great that additional help was necessary, in order to attend to the requests. These publications meet an instant response and fill a very great need. A large amount of very appreciative words of commendation have been received. Other similar circulars will soon be ready for publication.

Lake George Islands. There was such a decidedly increased demand for camp sites at Lake George this summer that it was necessary to develop new sites, in order to take care of the

increased number of campers. During the past year the signs indicating that the various islands are State property have been repaired and the names on the signs have been repainted. Some



THE COMMISSION'S RECREATION TRAILS ARE CLEARLY MARKED WITH COLORED METAL DISCS.

effort has been put forth in building docks and otherwise making the islands more useful to the campers. The work has been continued as in the past in regard to repairing the shores of the islands, and is practically completed. With a small amount of money each year it can be kept in a reasonably good condition and thus the islands protected from the elements.

John Brown Farm.

Necessary repairs have been made to the buildings this year, but, on account of the fact that they are old, it would be better policy for the

State to expend a reasonable amount of money in making more definite and permanent repairs to the buildings.

The conditions at the John Brown Farm are very unsatisfactory. A part of the house which was at one time the home of John Brown was at a later date increased in size in an attempt to make the house suitable as a home for the caretaker of the Farm. This has not been accomplished and, on account of the house being old and not adapted to comfortable living quarters,

steps should be taken to secure necessary funds to remodel the house along the line of its original plan, removing the added portion and building a separate and modern house for the caretaker. Since the place was occupied by John Brown a barn has been erected in the bend of the road in front of the house, and all visitors to the home and grave must make a detour around this barn, which has caused very unfavorable comment. The Commission cannot properly act in the matter on account of the lack of necessary funds. This barn should be removed to a place across a small brook and, together with the other repairs necessary, a suitable water supply should be installed.

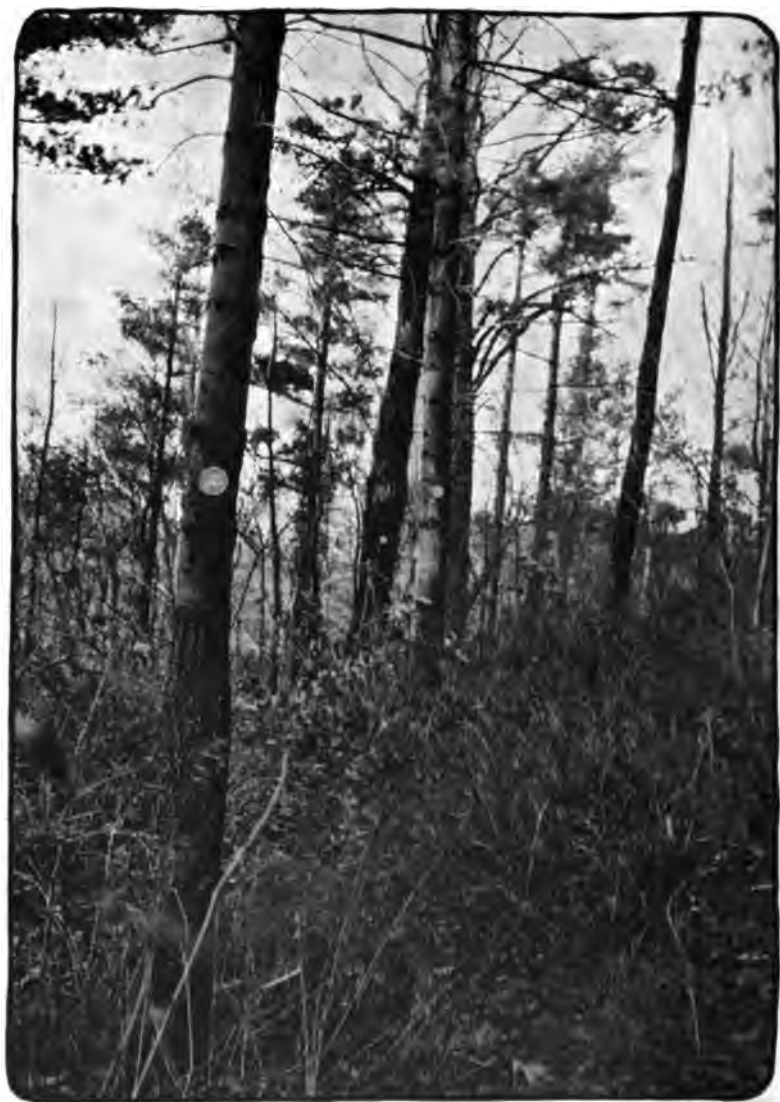
St. Lawrence Reservation. During the past year the pavilions have been extensively repaired, new foundations, floors and roofs replaced where necessary, and the buildings all repainted. This adds very greatly to their appearance; and the money has been carefully and well expended in making these necessary repairs. A new and large concrete dock has been built at Burnham's Point. Plans have been made for the construction of a smaller dock at Goose Bay. Plans were prepared for the erection of a pavilion at Long Point on Chaumont Bay, but we have been unable to obtain bids for the erection of this building.

Cuba Lake Reservation. The use of the State Reservation at Cuba continues to increase each year, and there have been 10 new leases issued, 3 terminated, and 21 transferred, making a total of 208 lots out of 272 under lease and a net gain of 7 leases for the year. There are also two small lots under lease for boat house purposes only. The gross revenue the last year was \$3,106.

About 600 feet of gravel road was built, which gave access from the public highway to six lots which formerly could be reached by boat only. These lots were leased almost immediately after work on the road was begun.

In addition, an outdoor fireplace was constructed which has been much used by picnic parties.

The tree planting contemplated for the year was postponed on account of the scarcity and high price of labor, but it is expected that these conditions will be better next spring, and that it will be done at that time. A large number of good sized trees are being reserved in the State nursery at Salamanca for this purpose.



EVEN THE TENDERFOOT CANNOT GO ASTRAY IF HE FOLLOWS THE SIGNS OF
THE GYPSY TRAILS.

FOREST FIRE PROTECTION

The forest fire problem of control and reduction of fires has taken the larger part of the time of the Assistant Superintendent of Forests. It has been considered from all practicable stand-points, and while the area covered is larger than in the past few years, the loss and injury is comparatively small. The season has been one of unusual drought and under the old system the loss by fire would beyond question have been another catastrophe. The complete fire organization includes an area commonly called the "fire towns" in the Adirondack and Catskill region, containing about seven and one-half million acres of land. A less comprehensive system is maintained on Long Island. In the remainder of the State the duty of fire protection is imposed on the Supervisors of the towns.

Fires of the Year. The fire season of 1920 was a peculiar one and it was particularly unfavorable to efficient fire protection. The fire hazard of the spring and fall periods, during which the forests are normally very inflammable, was intensified this year by unusually dry weather at those times. Report of the United States Weather Bureau shows throughout the State a marked deficiency below the normal for rainfall in both May and June, the May record for rainfall being the lowest since the disastrous drought of 1903. In the Adirondack region the precipitation for May was only 41 per cent of the normal, for June, 60 per cent of the normal. Practically no rain fell in this entire section during the period from May 24th to June 5th.

When these weather conditions are considered and also the exceptionally large number of people attracted to the woods by the fair weather and the May 30th holiday coming at the week end, it speaks well for the efficiency of our fire protective force that the damage was no greater.

While precipitation was up to or above normal from the middle of June to the middle of October, another dangerous condition of weather was encountered in the latter part of October, following the opening of the hunting season. Almost no rain fell in the Adirondack region from the sixth to the twenty-fifth of October. The deciduous trees shed their foliage during that time, with the



**THE COMMISSION'S CAREFULLY PREPARED CAMP SITES ARE PUBLIC CON-
VENIENCES AND PRACTICAL PREVENTATIVES OF FOREST FIRES.**

result that the ground was covered with a layer of leaves knee deep and exceedingly inflammable. The woods were filled with hunters from the cities, carelessly smoking and building camp-fires. Forest fires were kindled easily and once started they spread rapidly. It is not surprising that we had a total of 378 fires in the fire towns and an area of 17,811 acres burned over.

A classification of the fires of the year according to causes is given below:

Causes of Forest Fires, 1920.

Locomotives	95
Smokers	81
Fishermen	54
Hunters	51
Campers	30
Incendiary	16
Burning brush	15
Berry pickers	9
Lightning	8
Children	8
Burning buildings	5
Blasting	2
Burning rubbish	1
Lumberjacks	1
Sawmill	1
Steam roller	1
Total	378

The railroads have the credit for the largest number of fires, but the statistics include all known fires, regardless of the fact that many are very small. It is also a fact that most of these fires occurred on the outskirts of the forest region. They constitute 25 per cent of all the fires, but the area burned is only 2 per cent of the total.

Smokers caused the second largest number of fires, namely 21 per cent of the total. Fishermen were responsible for the third largest number of fires. They caused 14 per cent of the total

number, and to their carelessness is due the burning of 5,978 acres with a damage of \$5,350.

That sportsmen are still careless with fire in the woods is evidenced by the fact that fishermen and hunters together caused 105 fires, burned 10,117 acres and did damage to the extent of \$6,805.



THE SINGLE MEAL OR OVER-NIGHT CAMP ARE WONDERFULLY FACILITATED BY OPEN FIREPLACES.

Incendiary fires were worse this year than usual. They constituted only 4 per cent of the total number but burned 19 per cent of the total acreage. As a matter of fact, they were largely localized and plans have been formulated for the prevention of this evil in the future.

The 378 fires in the fire towns burned 17,811 acres and did damage estimated at \$12,725. It will be noted that the damage is low compared to the acreage burned. This is due to the fact that fires did not burn deep and were confined largely to areas previously lumbered or burned. Only one-half of one per cent of the total acreage was virgin timber. The proportion of State

land burned was above the average, being 36 per cent as against an average of about 10 per cent for the past few years.

The summaries of forest fire losses by both counties and causes are given on another page. A summary of fires according to months of occurrence is also submitted. The character of the fire season as described early in this report is reflected in this table.



96 OF THESE FIREPLACES HAVE BEEN BUILT IN A SINGLE SEASON.

Improvements. One new steel tower has been purchased during the year, and will be delivered during the winter. Next spring it will be erected on Ampersand Mountain in Franklin County. Early in the season towers were erected on West Mountain in Hamilton County, and on Balsam Lake Mountain and Red Hill, both in Ulster County. The steel tower on Gore Mountain in Warren County was blown down by a hurricane in October, 1919. It was reconstructed this year.

This leaves only three of our observation stations besides Ampersand Mountain not equipped with modern steel towers with enclosed shelters. On Prospect Mountain the cupola of an old hotel serves as an observatory; on Belleayre Mountain an open steel tower without a shelter is being used; while on Mohonk Mountain there is no tower. The last of these stations will be improved



LEAN-TOS AND FIREPLACES AT CONVENIENT POINTS ON TRAILS AND CANOE ROUTES INCREASE PUBLIC ENJOYMENT
OF THE FOREST PRESERVE AS NEVER BEFORE.

next season under plans just completed which provide for cooperative use of a memorial tower which is to be erected on Sky Top near Lake Mohonk. The matter has been taken up with the architects of the proposed tower, who are allowing for a first class observatory in the top of the memorial tower.

Mention has been made of the new tower constructed on Red Hill in Ulster County. This is located near the village of Clary-



STATE ACTION IS NEEDED TO PREVENT THESE BLOTS UPON THE FAIREST SCENERY OF THE EAST.

ville. Investigation disclosed a considerable area of forest and woodland in that section that was not adequately covered by observation stations. In establishing this station it was necessary to build three miles of telephone line and construct a cabin for the observer. This work was completed in midsummer.

A new observer's cabin was also built during the season on Swede Mountain in Warren County.

Two secondary observation stations have been operated during the fire season in cooperation with private land owners. One on Rock Lake Mountain in Herkimer County was operated in cooperation with the Nehasane Park Association, and one on Pillsbury Mountain in Hamilton County with the Champlain Realty Company.

The Dun Brook Mt. Station in Essex County was discontinued.

Practically no fires had been reported from there in several years and a careful study of the maps showed that a large proportion of the area visible from that station was covered by other stations. It is probable that a new station will be established next season to take the place of Dun Brook Mountain station.

Work was begun during the early part of the year on a most valuable and interesting map known as a "visibility map." Topo-



THE NEXT PARTY WENT A LITTLE FARTHER ON.

graphic maps of the Adirondacks were taken and the location of all observation stations marked on them. Then, the areas visible from each station — up to a maximum effective range of 15 miles — were indicated by cross hatching with colored inks. Where an intervening ridge cuts off the view from the station, the area back of that ridge is, of course, left uncolored unless, as frequently happens, it develops that the next station looks into that section. While this map is not yet completed, it has already given us valuable information on the effectiveness of our observation stations and the advantages or disadvantages of their location.

The preparation and installation of panoramic maps at the observation stations have continued as rapidly as weather conditions would permit. Panoramas have been completed during the season for the following 15 stations: Hadley, Wakeley, West, Moose

River, Woodhull, Stillwater, Beaver Lake, Bald, Cat, Tooley Pond, Hurricane, Whiteface, Loon Lake, Azure and Morris.

Panoramas have been installed at the following six stations: Cathead, Tomany, T Lake, Hamilton, Snowy, and Hadley.

The observation station trails have been kept up and improved, not only for the use of the observers, but also for the accommodation of visitors. A new trail was built to the new Red Hill station in the Catskills.

Visitors' registers were provided for each station, and the table submitted herewith shows not only the number of fires reported from each station, but also the number of visitors registered. The total of 24,319 persons is impressive, and stands for a great deal of educational work.

An extensive system of public fireplaces and camp sites along highways, trails through the wilder sections of the forest, and open camps for the accommodation of transients has been planned and partly completed during the year. This was discussed in detail under the heading of recreation, but it is mentioned here because one of its greatest advantages is in the safeguarding of camp fires and its effect in localizing the fire hazard due to the large number of sportsmen and tourists who go into the woods.

Forest Protection Week. A special appeal was made through the State-wide Forest Protection Week proclaimed by Governor Smith for September 12 to 18. His proclamation follows:

PROCLAMATION

STATE OF NEW YORK — EXECUTIVE CHAMBER

The forests of New York State constitute one of our greatest natural resources and as such are an asset of tremendous value and importance. They are essential to the industrial, physical and spiritual welfare of our State and its people.

The people of the State individually, and acting through their governmental agencies, have long endeavored to secure adequate protection of the forests from fire, the most destructive agency that threatens our woodlands.

Realizing that a more earnest and concerted effort is imperative if we are to safeguard our heritage, now, therefore, I Alfred E.

Smith, Governor of the State of New York, do hereby proclaim the week beginning Sunday, September 12, 1920, as

FOREST PROTECTION WEEK

and I call upon every citizen to spread broadcast the word of caution regarding forest fires; and upon clergymen, teachers and all public officials to exert themselves to the utmost to inform those with whom they come in contact of the transcendent importance of our forest resources and the need for their adequate protection.

Given under my hand and the Privy Seal of the State,
at the Capitol in the City of Albany, this twenty-third
day of July, in the year of our Lord, one thousand
nine hundred and twenty.

[SEAL]

ALFRED E. SMITH.

By the Governor:

JEREMIAH F. CONNOR,
Secretary to the Governor.

Copies of a pamphlet containing, besides the proclamation, an appeal from the Conservation Commission to the people of the State and also a plea to clergymen, school teachers, boards of trade, and others to spread the gospel of fire protection, were sent to every corner of the State by the Commission. Undoubtedly, much good was accomplished by this campaign, although no exact measure of its influence can be obtained.

Educational. Fire warnings have been spread broadcast as in other years through fire notices posted along roads and trails in the woods, printed on recreation circulars and maps having wide distribution, and also in telephone directories and the like. The educational film that teaches the lesson of fire protection was shown to thousands in moving picture shows.

Railroads. Improvement in the maintenance of fire protective devices on locomotives and in the removal of inflammable material from rights of way is emphasized in reports made by the chief railroad inspectors of this Department. The easing up of the labor situation has made it possible for the railroad com-

panies to attain better efficiency in the locomotive shop work. Spark arresters and ash pans are being steadily improved, not only in maintenance, but also in design.

The Commission has felt that great good can be accomplished by not only cutting and burning grass, weeds and brush on railroad rights of way, but by further reducing the fire hazard by burning the right of way broadcast. The cooperation of the



CANOE TRIPS OF MORE THAN ONE HUNDRED MILES CAN BE MADE IN THE FOREST PRESERVE.

railroad companies in this work has been secured, and this practice gradually extended. The common carrier railroads all burned their rights of way in the Adirondack region at least once, in the spring of 1920, and some burned them over again in the fall. This is a better showing than has been made in any previous year.

Probably the most notable event in railroad fire protection during the season was the relief given the New York Central, Delaware & Hudson, and Grasse River railroads from the necessity of operating oil burning locomotives in the Adirondacks. During the daytime from April 15th to November 1st oil burning has been required since 1909 under an order issued by the Public Service Commission at the request of the Forest, Fish

and Game Commission. It has been effective in preventing railroad fires, and for that reason the Conservation Commission has constantly urged its continuance.

Early in 1920, however, the railroads petitioned the Public Service Commission for relief, because they alleged that they were unable to get sufficient fuel oil. Investigation by the Conservation Commission indicated that such was the fact, and we advised the Public Service Commission that we would not object



TIRED NERVES ARE REFRESHED IN THE STATE OWNED AND PROTECTED WOODS.

to temporary relief from oil burning under certain conditions, the most important of which were as follows:

1. That only locomotives equipped as specified — such specifications including the most effective types of spark arresters and ash pans for the types of engines used — should be used and that these should be inspected daily by competent inspectors employed by the railroad companies; reports of such inspections to be filed with both the Public Service Commission and the Conservation Commission.
2. The maintenance by the railroad of a very intensive patrol carefully checked up by responsible railroad officials.
3. The maintenance of fire-trains in condition for use at all times.



MORE THAN ONE HUNDRED STATE OWNED ISLANDS OFFER FREE CAMP
SITES ON LAKE GEORGE.

4. The keeping on hand of locomotives equipped to burn oil and a small supply of oil for them, in order that the oil burners might be put back into service immediately should such action be necessary.

The order giving relief from oil burning was extended from time to time until the end of the season (except in the case of the Delaware & Hudson, which elected to burn oil beginning

August 1), because, although oil became obtainable by midsummer, the price was exceedingly high, and the Department did not object to short term extensions for the use of coal burners as long as the railroads complied as strictly with the conditions as they did through the spring.

The showing made redounds greatly to the credit of the railroads. It has long been realized that the greatest single objection to the use of coal fuel, where properly equipped superheater locomotives could be used, was the human element in maintaining the fire protective devices. The situation during the 1920 season involved considerations that demanded the attention of the better trained, more responsible railroad officials to the problem of the safe operation of coal burning locomotives. Under their supervision nothing that would prevent fires was left undone.

Only a very few small fires occurred where the coal burning engines were substituted for the oil burners, and practically no damage was done. However, it is still the feeling of the Commission that oil burning is the safest and that not more than a temporary relief, under the strictest safeguards, can be considered for a moment.

Violations. Violations of the laws relating to slash disposal and forest fires have been slightly more in 1920 than in 1919, although still far below 1918. A total of 79 cases were reported; 71 cases were settled for a total of \$1,651.55. Labor conditions, particularly in the first part of the year, were responsible for carelessness in top lopping, but with present improvement in the labor market we should have fewer violations of this statute in the near future.

The following summary of violations has been prepared:

Summary of Violations of the Fire Law, 1920

(December 1, 1919, to November 30, 1920)

OFFENSE	Total number of cases reported	Number of cases closed	Amounts recovered
Failure to lop tops (Sub. 2, Sec. 54)	39	37	\$1,213 40
Causing forest fires (Sub. 3, Sec. 54)	25	21	352 35
Setting fires to clear land (Sub. 5, Sec. 54)	13	13	85 80
Failure to maintain railroad patrol (Sub. 1, Sec. 55)....	1	....	.....
Operating defective locomotives (Sub. 3, Sec. 55).....	1	....	.....
Totals	79	71	\$1,651 55

Weeks Law. Cooperation with the United States Government under the so-called Weeks Law has been continued. Under this arrangement the government paid salaries of observers totalling about \$6,000. Under the cooperative agreement two fires have been reported by star route or rural free delivery mail carriers.

Discussions of national forest policy have brought out the fact that fire protection is the most important fundamental of any plan of forest perpetuation. Recognition of this by the Federal Government means that if allowed the greatly increased appropriations which the United States Forest Service plans to request from the next Congress, the assistance offered the various States will be greatly increased in the future.

Conferences. Realizing the need for the development of better methods of fire protection, the Commission called a Forest Fire Conference to be held in Albany, N. Y. on February 25 and 26, 1920. Invitations were sent to representatives of forest fire protective associations, State forest officials, the United States Forest Service, timberland owners and others from the north-eastern United States and Canada who might be interested in or contribute to the discussions.



THOUSANDS EACH SUMMER VISIT THE SPOT WHERE "JOHN BROWN'S BODY LIES 'MOULDERING IN THE GRAVE.'"

Another conference was called at Albany September 28, 1920, when representatives of various northern and eastern states were present to effect a closer organization and secure more uniformity of fire laws and closer cooperation between the states and the Federal Government. This meeting took the form of a permanent organization.

Fire Hazards. Lumbering operations always leave a slash. The amount of slash depends upon the degree of utilization of the

tree cut, and the fire risk resulting varies with the amount and kind of the refuse left. Some means must be found for more complete utilization and removal of this slash; or for some kind of slash disposal; or for a patrol to prevent fires occurring while the slash is decaying.

The rapid increase in the extent of hardwood lumbering operations in recent years compels us to consider the extraordinary fire hazard thus created. At the request of this Department the United States Forest Service sent a representative to study the question of taking care of this additional hazard.

At this point it is proper to mention the administration of the highway rights of way or on a strip adjacent thereto. Numerous violations of this statute have been reported, but as practically all of them were due to ignorance of this comparatively new provision of the law, no penalties have been collected. The Department has, however, secured the removal of the material in question in practically every case, and has thus done away with the fire hazard which is, of course, the purpose of the statute.

Long Island. This is the first year that our protective system in the Long Island District has been in full operation. The district ranger appointed in December, 1919 has been on duty continuously. Besides this, the two observation stations were operated throughout the summer and an additional station was manned during the spring months.

The three stations reported 203 fires. In most cases word was given promptly to town supervisors or fire wardens; but there is need for better organization and special fire fighting equipment. The district ranger has been able to bring about some improvement in these conditions during this season, but the job is only just begun.

A total of 101 fires have been reported from the Long Island district. These are estimated to have burned over 17,365 acres and damaged property to the extent of \$2,545.

State-Wide Forest Fire Problem. There is a large actual and potential loss throughout the State due to forest fires. There is no accurate data as to this loss. There are, however, a large number of forest fires each year which are preventable and, if proper steps are taken, a big economic loss can be prevented. We

believe that a proper fire organization can best be accomplished through the proposed district forester plan which is more fully discussed in another part of this report.

REFORESTATION

The amount of reforestation accomplished in this State during the past year has not been so great as during recent years. This is due to the fact that during the war tree production was less, and the lack of stock for planting is now being felt, since it requires three or four years to produce trees of suitable size for reforestation. In addition to the depression caused during the war, further trouble has been experienced in securing seeds of desirable tree species, because of the fact that certain trees, notably red pine, have not produced crops of seed, and foreign seeds formerly imported could not always be obtained.

The shortage of tree stock resulting from the above causes, however, has given opportunity for improving the soil in the nurseries by growing cover crops and for making changes in nursery sites and bringing about other necessary improvements.

This shortage of planting stock is only temporary, since it was possible to plant enough seeds to produce 10,350,000 trees. The reforestation of State land has been limited in order to supply trees to private land owners. The planting on State land has been confined to stock that had to be moved because of its size.

Nurseries. Several changes which were begun in the nurseries last year have been continued, resulting in bringing a much larger area of land under nursery development. It has been found that a larger area is needed for tree production for the following reasons:

First. In order to allow a greater rotation of crops than has formerly been practiced. We find that a green cover crop should be grown at least every third year, in order to keep the soil in the best condition for producing trees.

Second. There seems to be a growing demand on the part of the public for trees for reforestation idle lands throughout the State and, therefore, in the future the State will be called upon to furnish larger quantities of trees.

Third. The enactment of the "Free Tree Bill" by the last Legislature will permit free distribution of trees under certain restrictions, and this it is anticipated will require increased facilities for tree production.

The principal changes which have been accomplished are as follows:

1. The Saratoga and Comstock nurseries have been consolidated. A new nursery site on State land has been developed about one mile south of the former site of the Saratoga nursery. The land at this place is much better adapted for growing trees than the old Comstock nursery or the former site of the Saratoga nursery. An area of 44 acres has been cleared and made ready for nursery use at this place. This nursery has been fully equipped during the past year and it has been found that the operation of the nursery on a large scale has made it feasible to use machinery to a greater extent than ever before in carrying on nursery work.

2. A new nursery site of 10 acres has also been developed at Lake Clear Junction and will be operated in connection with the Upper Saranac nursery. This will provide ample opportunity for growing cover crops to improve the soil in the older nursery sites.

3. The Rome nursery is a new development undertaken in cooperation with the Rome State Custodial School at that place, the work being entirely carried on by inmates of the Rome Custodial School, supervision, however, being furnished by this Commission. During the past summer 300,000 trees were transplanted and cared for in this way. The Rome nursery is well situated as a distribution center for trees and it is expected that it will be developed to a much greater extent.

The Salamanca nursery is being operated to a limited extent only. Owing to the fact that the demand for trees in the western part of the State is not very great and in the past the larger portion of trees produced there has been shipped to the eastern half of the State or the Adirondacks, it does not seem advisable to continue this nursery at its maximum production. The Central Islip nursery is being operated as usual.

The present inventory of stock in the nurseries is 16,919,850 or 7,475,870 more trees than were in the nurseries a year ago.

The quantity of trees shipped from the several nurseries the past year was as follows:

Saratoga	732,200
Comstock	398,200
Central Islip	168,600
Salamanca	581,775
Saranac	1,563,625
Indian Lake	260,000
Goldsmiths	75,000
	<hr/>
	3,779,400
	<hr/>

These trees consisted of white pine, Scotch pine, red pine, Norway spruce, blue spruce, white spruce, white cedar, black locust, Carolina poplar, white ash, willow, and tulip.

An inventory of the nurseries December 1, 1920, shows the following quantities of trees of all ages:

Inventory of Nursery Stock, December 1, 1920

	Saratoga	Saranac	Comstock	Central Islip	Salamanca	Rome	Total
White pine	5,385,000	2,069,000	1,365,000	61,700	980,000		9,860,700
Red pine		12,500					12,500
Scotch pine	1,250,000	143,850	225,000	109,600	190,000	220,000	2,138,450
Norway spruce	2,318,000	420,100	172,000	36,400		75,000	3,021,500
White spruce	680,000	175,000					855,000
White cedar	826,000	21,000	103,000	26,700			976,700
Black locust	45,000						45,000
Tulip				5,000			5,000
White ash	5,000						5,000
Totals	10,509,000	2,841,450	1,865,000	239,400	1,170,000	295,000	16,919,850

The present plan is to increase the stock in the nurseries until there is an annual output of not less than 15,000,000 trees per year.

Reforestation State Land. During the spring and fall planting seasons, 1,257,425 trees were planted on lands in the Forest Preserve.

State institutions received only 51,500 trees this year. The shortage of labor in the various Departments seems to have reacted unfavorably upon the planting of trees by State institutions.

Sale of Trees. Sale of trees during the year amounted to 2,470,475, being an increase of 205,420 trees over the number sold last year. The scarcity of help and high cost of labor has had a direct influence upon the sale of trees, since many applications for trees were cancelled last spring because of the inability of the land owners to secure necessary help for planting them.

Experimental Plantations on Long Island. In order to demonstrate to the land owners of Long Island the possibility of reforesting the vast area of waste and burnt over lands existing there, four experimental plantations of about five acres each were established in cooperation with the Board of Supervisors of Suffolk county. The trees were planted on county owned land in the typical burned over districts in the towns of Babylon, Islip, Brookhaven and Easthampton.

It is expected that these plantations will prove successful examples of reforesting these unproductive Long Island lands and that with adequate fire protection, many land owners will be encouraged to enter into an extensive program of reforesting.

Planting Plans. The extensive plantations which have already been made on State land during the past years have now reached sufficient development to serve as a guide in making further plan-



THE TROUBLE MAN MUST BE A WOODSMAN ON THE TELEPHONE LINES TO MOUNTAIN STATIONS.

tations. Based upon past experience, planting plans are now being prepared for the denuded portions of the Forest Preserve. During the past season, parcels aggregating 5,460 acres have been examined and detailed plans have been prepared showing the character of the land to be planted, and soil types and tree species best adapted for reforesting these areas.



TELEPHONES IN THE OBSERVATION TOWERS ARE FIRE ALARM BOXES.

Free Tree Bill. Chapter 460 of the Laws of 1920 appropriated \$25,000 for the purpose of growing trees to be supplied to owners of land in this State for reforesting under such conditions as the Commission might deem proper. Under an opinion of the counsel to the Commission, this law did not make the distribution of trees under these conditions immediately available, as his opinion held it was necessary to wait until trees had been grown under this appropriation before this plan could be put into effect; in other words, it should be construed as similar to the fact that if we suppose an appropriation is made by the Legislature for the construction of a building or some project, that the building would not become available until it had been erected. Some legislation

should be passed this winter overcoming this situation, as it is going to be difficult to operate one nursery simply for free trees and the other nurseries for trees for sale.

WHITE PINE BLISTER RUST

The work of checking the white pine blister rust has been in active progress since 1916. During these four seasons much useful information has been obtained in regard to the disease and methods of control in this new line of activity.

By the beginning of the year 1920 we were in possession of a large amount of data, gathered from the field through the past years, and were in a position to meet the situation with a program which included: (1) Eradication of ribes on State and private land, using the accepted seven-crew method; (2) the encouragement of cooperation with private owners, either through the contribution of funds or of labor; (3) demonstration



STEEL TOWERS ON THE MOUNTAIN STATIONS ARE
ERECTED BY RANGER LABOR.

field work and experiments for obtaining data on, (a) distance of spread of infection from ribes to pine, (b) amount of re-stocking of ribes on areas previously worked, (c) relation between leaf surface destroyed and number of bushes pulled; (4) the

organization of a checking-training crew; (5) scouting for new infection centers; and (6) an educational campaign, by the use of motion pictures, slides, exhibits, personal interviews, distribution of publications, etc.

The work was in general charge of one person with supervision on each eradication job; a checking crew working independently to ascertain if the work was done efficiently; scout work to locate



IT TAKES A SURE-FOOTED HORSE TO HAUL A STEEL TOWER UP MANY OF THE MOUNTAINS.

the extent of spread of the disease and educational work to inform owners of white pine of the nature of the disease, its destructive effects and means of control.

Eradication Work was done at various places on both State and private lands. On State land 799 acres were worked at Sugarbush; 470 acres at Goldsmiths; North Hudson, 342 acres; and Hoffman, 841 acres. At all of these places were plantations of white pine made several years ago in infected sections where the gooseberry and currant bushes were numerous.

Cooperation eradication work was done at various places in Essex and Warren counties on private lands where the owners or private funds paid one-fourth the expense. Work of this char-

acter covered 4,786 acres. About 200 other acres were covered by private owners in St. Lawrence county, largely at the owners' expense. Several owners have commenced work on their own account after investigating the work done.

Checking. In order to ascertain the efficiency of the work, a crew made check inspections and found after 44 such checks that 97 per cent of the bushes were removed the first time over. Other observations made at various times on the several jobs failed to show a single case of careless work.



THE OBSERVER'S CABIN ON AMPERSAND MOUNTAIN.

Educational. The people who should realize the seriousness of this disease seem to lack information, and owners of timber fail to appreciate the way a "rust" lives and spreads. It, therefore, seemed very necessary to get into close touch with a greater number of people quickly. To do this, a moving picture film was loaned by the United States Department of Agriculture, showing the white pine and illustrating the disease. A representative traveled the white pine belt of the Champlain Valley for about two months and held thirty meetings at which the films were exhibited, and in this short time brought the matter to the close attention of 2,315 people who attended these lectures.

Policy. The State should continue to interest owners of white pine and cooperate in eradication work, but each year place a larger share of the expense upon the individual. It is the common belief of pathologists and foresters that the gooseberry and



AT THE OBSERVER'S HEADQUARTERS ON THE TRAIL TO AMPERSAND MOUNTAIN CLIMBERS ARE ACCOMMODATED
OVER NIGHT.

currant bushes can be eradicated and thus the host of the rust removed, and then that white pine, our staple timber tree, can be grown into merchantable size. On the other hand, unless this is done the white pine as a timber tree has no future. We will have lost one of our most valuable timber trees, a source of necessary lumber supply and a plant that is well adapted to poor lands as a means of making them produce a valuable crop and enabling these lands to be productive.

Scouting. Examinations which have been made show that in some localities the infection of pine by the disease is as high as 25 per cent of the trees. The disease has been found nearly all over the State in various localities.

STATE-WIDE FORESTRY

The increased demand for wood material and the reduced supply on hand has more and more accentuated the necessity for the practice of forestry which resolves itself simply into the use of lands, which are economically fitted for growing timber. Forestry is the production of wood crops upon forest soils. Our forests have been depleted through use and proper steps have not been taken to keep these lands under forest production. Failure to do so is a great economic loss to the whole State, to the owners of the land, and to the consumers of material, and if we expect to have wood materials in the future at a reasonable price, steps must be taken to place these millions of acres which we have in this State under wood crop production.

This matter has been brought to the attention of the people and the Federal Government, and during the past year has brought forth more discussion than in any previous year in regard to this question. Pursuant to Resolution 311 of the United States Senate, the Forest Service of the United States Department of Agriculture prepared and transmitted to Congress a report on "Timber Depletion, Lumber Prices, Lumber Exports, and Concentration of Timber Ownership." Upon page 16 of that report the following statement is made in regard to conditions in New York State:

"Practically the entire State of New York was originally covered with a magnificent forest of white pine, spruce, hemlock

and hardwoods. The lumber industry was one of the first to be developed. It reached its highest volume between 1830 and 1840 and was already declining at the time of the Civil War. In 1850 New York ranked first among the states in amount of lumber cut and contributed 20 per cent of the total cut of the entire country. Since then it has been steadily declining in relative importance until to-day it stands in twenty-fifth place and contributes only 1 per cent of the total cut. Its actual cut has decreased from over 1,300 million feet prior to 1850 to less than 350 million.

"As early as 1856 New York ceased to be an important exporter of lumber and began to draw on Michigan for the upper grades of pine. Pennsylvania hemlock, southern pine, and cypress were used in large quantities from 1880 on, and West Coast woods in upper grades and special sizes began to come in about 1900.

- To-day Douglas fir from the Pacific Northwest is a very considerable factor in the lumber market of the State. The steadily decreasing supply of native woods as compared with the increase in population is illustrated by the fact that New York's per capita production of lumber had fallen from 300 board feet in 1869 to about 30 board feet in 1918.

"With the gradual settlement of the State the area of forest land steadily decreased until to-day it forms about 41 per cent of the total area. The stand of timber is estimated at approximately 26,000,000,000 board feet, of which white pine, spruce, and hemlock comprise about 10 per cent each, and birch, beech, and maple a total of 55 per cent. Spruce and hemlock suitable for pulp wood but not lumber comprise some 13,400,000 cords, while material of all species suitable only for fuel and acid wood adds another 107,000,000 cords. This gives a total stand for the State of approximately 17,132 million cubic feet.*

"In quality, the present stand is decidedly inferior to that of earlier days. White pine, of the large size and high quality for which the State was once famous, now furnishes little but the poorer grades. Of the total forest area 62 per cent contains material which is suitable neither for lumber nor pulp and furnishes only fuel or acid wood. While the area of lands com-

* Equivalent to about 49,000,000,000 board feet.

pletely denuded is comparatively small, the original forests are being followed by stands of decidedly inferior quality, both as to species and grades. The damage by fire is being steadily reduced by systematic fire protection, but the methods of cutting in private lands are such that an increasingly large area is left partially or wholly devastated."

A publication has been issued by the United States Forest Service, being Department of Agriculture Circular 112, entitled "Timber Depletion and The Answer." From this the following extract is made, setting forth the conditions generally in the United States:

"The original forests of the United States are estimated to have covered 822 million acres and to have contained 5,200 billion board feet of timber. Over two-thirds of this area has been culled, cut-over, or burned. There are left to-day about 137 million acres of virgin timber, 112 million acres of culled and second-growth timber large enough for sawing, 133 million acres partially stocked with smaller growth, and 81 million acres of devastated and practically waste land. We have 463 million acres for forest land of all sorts which contains about 2,214 billion feet of timber of merchantable sizes. Three-fifths of the timber originally in the United States is gone.

The Rate at Which Our Forests Are Being Used Up. "The cutting and loss of merchantable timber consume about 56 billion board feet yearly. About 40 billion feet of this amount is cut from the virgin forests still left, the rest from second growth. We are even cutting into pulp-wood, acid wood, and fuel 14 billion cubic feet per year of material too small for sawing. All told we are taking about 26 billion cubic feet of material out of our forests every year and growing about 6 billion feet in them. We are cutting more of every class of timber than we are growing. We are even using up the trees too small for the sawmill but upon which our future lumber supply depends three and one-half times as fast as they are being produced.

"Our annual wood bill includes 40 billion feet of lumber, 87 million hewed railroad ties, nearly 5½ million cords of pulp-wood, a third of which is imported, and 110 million cords of fuel. This use of wood cannot be appreciably reduced without serious



LADDERS, STAIRS, AND HAND RAILS HAVE IMPROVED THE AMPERSAND TRAIL.

injury to the agriculture, the home building, and the manufactures of the United States. The pressure of the war brought our per capita consumption of timber down to 300 board feet yearly and the country has suffered from it in the shortage of dwellings and the curtailed output of many industries. Even with large allowances for the substitution of other materials, the United States will require at least 35 billion feet of lumber yearly, aside from enormous quantities of wood pulp and other

products of the forest. We can not cut our per capita use of lumber to one-half or one-third the present amount — to the level of European countries where lumber is an imported luxury — if our resources are to be developed and our industrial supremacy retained. And we must ourselves grow the great bulk of the wood we need, for large increases in lumber imports are not possible at reasonable prices.

The Timber Left Is Not in the Right Place. “The crux of timber depletion is the exhaustion, or partial exhaustion, of the forests most available to the great bulk of our population, agriculture, and manufactures. One timbered region after another in the Eastern States has been cut out. Less than 5 per cent of the virgin forests of New England and but 12 per cent of her original stand of timber are left. New York, the leading state in lumber production in 1850, now manufactures only 30 board feet per capita yearly, or not more than a tenth of the requirements of her own population and industries. Pennsylvania was the leading lumber manufacturing State in 1860. She now cuts less than the amount consumed in the Pittsburgh district alone.

“The original pine forests of the Lake States, estimated at 350 billion feet, are now reduced to less than 8 billion. In 1892 the sawmills in the region bordering the Great Lakes cut 9 billion board feet of lumber and largely supplied the softwood markets of the Prairie and Central States and eastward to New England. To-day their yearly cut is a single billion. These four densely populated regions, stretching from the Atlantic to the Prairies, which formerly were lumber exporters and still contain enormous areas of forest land, are now largely dependent upon timber grown and manufactured elsewhere and are becoming increasingly dependent upon timber which must be shipped the width of the continent.

“The bulk of the building and structural timbers used in the Eastern and Central States during the last 20 years was grown in the pine forests of the South. In 1909 the southern mills cut 16 billion feet of pine and dominated the larger markets as completely as the northern pine did before. The virgin pine forests of the South are estimated to have contained 650 billion feet of timber; they now contain 139 billion feet aside from consider-

able quantities of second growth. The cut of southern pine is falling off and within another decade promises to exceed by little, if at all, the requirements of the Southern States themselves.

"The migration of the hardwood lumber industry has followed much the same course, although the regional lines are less distinct. The commercial cut of hardwoods in the Middle States is almost a thing of the past. It has fallen off materially in the Lake States and is now decreasing in the Southern Appalachians. The principal reserve of hardwoods is in the Southern Mississippi



TREE PLANTING IS PART OF THE CURRICULUM OF THE STATE COLLEGE OF FORESTRY.

Valley, and even here it is doubtful if the cut of hardwood lumber can be materially increased for any length of time. The scarcity of high-grade oak, poplar, ash, hickory, walnut, and other standard hardwoods is now confronting many American industries with a critical condition.

"Since 1909, the United States has ceased to be self-supporting in newsprint paper. There are large quantities of pulp timber in the Western States and in Alaska, but industrial and transportation conditions prior to the war largely rendered them unavailable to the user of paper. The depletion of pulp-woods in the Eastern and Northern States is reflected to-day in the importa-

tion of two-thirds of our newsprint or newsprint materials from Canada.

"A similar situation prevails in the naval-stores industry. It has moved from State to State throughout the southern pine belt, exhausting the resources of each in turn. In 1919 the production of turpentine and rosin had fallen off 50 per cent. Within ten years the United States will lose its commanding position in the world's markets for these products. As yet the vast resources of the western coniferous forests have not been touched because they have not been commercially available.

"One-half of the timber remaining in the continental United States is in three States bordering the Pacific Ocean. Sixty-one per cent of it lies west of the Great Plains. Since 1894 western timber has been filling gaps in the Eastern and Middle Western markets. Within the past year it has assumed a dominating place in the principal markets of the Lake States and has largely replaced southern pine at many consuming points in the Central States. An experienced lumberman has estimated that within the next decade the shortage of nearer timber will compel the Eastern and Central States to increase their annual consumption of western lumber by 11½ billion board feet.

"The true index of timber depletion is not quantity but availability. It is shown partly in the cost of transporting the average thousand feet of lumber from mill to user. Prior to 1850, when the great bulk of our lumber was manufactured near the points of use, the transportation cost averaged less than \$3 per thousand board feet. Today it is probably \$10. In another decade, at freight rates now prevailing, it will reach \$15 per thousand feet. But aside from rising freight costs, the exhaustion of nearby supplies of timber imposes upon the consumer all the disadvantages of being dependent upon distant and restricted manufacturing regions. These include congestion of transportation, the effects of labor shortages and bad weather in limited regions, and a narrowed field of competition.

"Not only is the quantity of timber left in the United States being used up much more rapidly than wood is being grown; the availability of the remaining timber to the average consumer is steadily decreasing. The situation which confronts us now will

be different only in degree if we allow the western forests also to be exhausted and are compelled to import much of our lumber from Siberia or South America.

The Answer—A National Forest Policy. “The depletion of timber in the United States has not resulted primarily from the use of our forests, but from their devastation. The kernel of the problem lies in the enormous areas of forest land which are not producing the timber crops that they should. There are 326 million acres of cut-over timber lands bearing no saw timber. Their condition ranges from complete devastation through various stages of partial re-stocking with trees of inferior quality, to relatively limited areas which are producing timber at or near their



SCHOOL CHILDREN HAVE PLANTED HUNDREDS OF ACRES WITH TREES UNDER THE SUPERVISION OF THE STATE COLLEGE OF FORESTRY.

full capacity. On 81 million acres there is practically no forest growth. This is the result of forest fires and of methods of cutting which destroy or prevent new timber growth. There were 27,000 recorded forest fires in 1919, burning a total of $8\frac{1}{4}$ million acres. During the preceding year, 25,000 fires burned over $10\frac{1}{2}$ million acres of forest land. An additional large acreage was burned each year, of which no record could be obtained.

"The area of idle or largely idle land is being increased by from 3 to 4 million acres annually as the cutting and burning of forests continue. The enormous area of forest land in the United States not required for any other economic use, estimated at 463 million acres, would provide an ample supply of wood if it were kept productive. Depletion has resulted, not from using our timber resources, but from failure to use our timber-growing land.

"Nor does this situation exist simply in the less developed and thinly settled regions of the country. The State of Massachusetts, as a typical example, contains denuded forest lands, within a stone's throw of her dense population and highly developed industries which have been estimated at one million acres and which are largely idle as far as growing wood of economic value is concerned.

Concerted Action to Stop Forest Devastation. "A remedy for this appalling waste must be found in a concerted effort to stop the devastation of our remaining forests and to put our idle forest lands at work growing timber. It is inconceivable that the United States should forfeit the economic advantage of its enormous timber-growing resources, and that it should go on using up its forests with no provision for growing more until wood products are priced on the basis of imported luxuries and their use is restricted to the lowest possible scale of civilized existence. The concerted action necessary to put an end to forest devastation must enlist the National Government, the respective States, and the landowner.

"It is impracticable to nationalize all of the forest land in the country, or even the major portion of it. On the other hand, the results needed cannot be attained if timber production is left to the initiative of the private owner of lands or is sought solely through compulsory regulation of private lands. Not only has the public very large interests at stake which justify an assumption of part of the burden; certain fundamental causes of forest devastation can be removed only by public action. Chief among these are the fire hazard of forest properties, particularly of growing forests, and a property tax system which discourages or may prevent the landowner from engaging in the business of growing timber.

"On the other hand, the public cannot and should not do it all. A measure of responsibility rests upon the landowner, and should

be recognized in equitable requirements as to the handling of his land. It is a case of the public and the private owner alike doing their part. Our policy must aim toward timber production on somewhat the same footing as in France or Scandinavia — as an established national practice. This calls for a core of public forests, public instruction and example, public encouragement in protection and taxation, and a responsibility recognized by forest owners to keep their lands productive.



TYPICAL HARDWOOD SLASH WHICH INCREASES FIRE HAZARD AND PREVENTS NEW GROWTH.

“ This summary would not be complete without indicating the essential steps which should be taken to stop timber depletion. The plan here outlined is built up on the belief that the most rapid progress will be made by utilizing the recognized police powers of the several States to stop forest fires and bring about better handling of privately owned forest land. The equitable adjustment of timberland taxes in such ways as will promote timber production is a responsibility of the individual States. At the same time the national importance of stopping timber depletion calls for the taking of an active part by the Federal Government, particularly in aiding the forest activities of the States, standardizing technical practice in fire protection and forest renewal, and largely extending national acquisition of forest land.”

There has been agitation and discussion in regard to putting forth a proper policy to meet the situation. There are people who advocate the enactment of a national law for the control of the cutting and management of all forest lands, and there are others who advocate a similar control by State laws. We believe that better progress can be made by the selection of proper district foresters and the division of the State into districts and having these foresters work out the problem in cooperation with the land owners, solving the problems as they present themselves in the various localities, rather than entirely through mandatory laws, such as above referred to. Forest conditions are widely different in various sections of the State and different tracts of land present different problems. The constant soaring price of timber lands and the timber in the market all affect the cost of building and, in every way, exert a great influence upon the commercial development of the State, the maintenance of our industries, the employment of labor, and the cost of living, and most intimately relate themselves to the life and prosperity of every community in the State. The small expenditure which will be necessary for this purpose is trivial when compared to the work that could be accomplished, and every year this matter is delayed only makes the situation more aggravated.

Details in regard to the plan were so fully set forth in our report last year that it seems unnecessary to repeat them here.

SUMMARY OF FOREST FIRE LOSSES, 1920, BY COUNTIES

COUNTY	Num-ber of fires	Total acreage burned	Total expense of fighting fires	Acres private land burned				Acres State land burned				Value of standing timber destroyed	Value of logs, lumber, etc., destroyed	Value of buildings, fences, etc., destroyed		
				ADIRONDACKS				CATSKILLS								
				Virgin timber	Second growth	Brush	Waste	Virgin timber	Second growth	Brush	Waste					
ADIRONDACKS																
Clinton.....	41	516	\$190 60	.....	484	12	10	.....	.....	.....	.....	\$3 375 00	\$80 00	.....	\$70 00
Essex.....	85	526	1,174 84	3	289	146	45	.....	.....	.....	.....	705 00	.....	.....	.....
Franklin.....	30	763	2,925 48	.....	6	667	18	1	10	61	.....	100 00	.....	.....	.....
Fulton.....	2	7	13 06	.....	5	.....	2	.....	.....	.....	.....	.....	.....	.....	.....
Hamilton.....	43	4,411	2,215 32	.....	400	198	30	.....	1,498	1,499	784	875 00	.....	.....	.....
Herkimer.....	20	499	2,593 70	1	130	195	22	.....	142	10	.....	350 00	.....	.....	.....
Lewis.....	15	3,891	2,717 70	.....	282	1,757	852	.....	.....	1,000	.....	1,500 00	.....	.....	.....
Oneida.....	6	310	119 26	.....	.....	230	80	.....	.....	.....	.....	.....	.....	.....	.....
St. Lawrence.....	41	1,676	6,692 58	.....	39	1,117	337	.....	145	6	32	3,225 00	280 00	50 00	.....
Saratoga.....	6	303	146 94	.....	300	.....	.....	.....	325	25	.....	50 00	.....	50 00	.....
Warren.....	40	1,190	1,761 16	50	512	223	30	25	.....	.....	.....	903 00	.....	.....	.....
Washington.....	2	10	8 40	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total Adiron- dacks.....	331	14,102	\$20,259 04	54	2,457	4,558	1,426	30	2,125	2,631	821	\$11,175 00	\$360 00	.....	\$170 00
CATSKILLS																
Delaware.....	13	295	\$119 00	.....	130	£8	107	.....	.....	.....	.....	\$100 00	.....	.....	.....
Greene.....	3	10	97 00	.....	9	.....	1	.....	.....	.....	.....	.....	.....	.....	.....
Sullivan.....	3	121	92 80	.....	120	.....	.....	.....	.....	.....	.....	150 00	.....	.....	.....
Ulster.....	28	3,283	875 12	.....	1,600	471	332	.....	800	80	.....	690 00	\$90 00	.....	.....
Total Catskills.....	47	3,709	\$1,183 92	.....	1,859	530	440	.....	800	80	.....	\$940 00	\$80 00	.....	.....
TOTALS																
Adirondacks.....	331	14,102	\$20,259 04	54	2,457	4,558	1,426	30	2,125	2,631	821	\$11,175 00	\$360 00	.....	\$170 00
Catskills.....	47	3,709	\$1,183 92	.....	1,859	530	440	.....	800	80	.....	940 00	80 00	.....	.....
Grand totals.....	378	17,811	\$21,442 96	54	4,316	5,088	1,866	30	2,925	2,711	821	\$12,115 00	\$440 00	.....	\$170 00

SUMMARY OF FOREST FIRE LOSSES, 1920, BY CAUSES

CAUSE	Num-ber of fires	Total acreage burned	Acres private land burned				Acres State land burned				Value of standing timber destroyed	Value of logs, lumber, etc., destroyed	Value of buildings, fences, etc., destroyed	
			Virgin timber	Second growth	Brush	Waste	Virgin timber	Second growth	Brush	Waste				
ADIRONDACKS														
Locomotives.....	81	200	.....	96	14	15	.....	45	6	24	\$395 00	\$80 00	.....
Smokers.....	74	1,047	.....	477	445	31	.....	5	24	9	2,555 00	200 00	\$85 00
Fishermen.....	53	5,977	1	305	3,342	1,227	1	1	1,092	8	5,220 00	80 00	50 00	
Hunters.....	41	3,638	50	780	217	47	25	1,315	779	425	1,350 00	.....	25 00
Campers.....	29	460	.....	313	30	2	.....	106	3	5	510 00	.....	.....
Incendiary.....	13	1,730	.....	150	100	.....	.....	403	727	356	275 00	.....	.....
Burning brush.....	12	713	.....	310	137	16	.....	250	.....	.....	700 00	.....	10 00
Berry pickers.....	7	7	.....	1	2	4	.....	.....	.....	.....	25 00	.....	.....
Lighting.....	8	209	.....	2	205	2	.....	.....	.....	.....	.....	.....	.....
Children.....	4	2	.....	.....	37	1	.....	.....	.....	.....	.....	.....	.....
Burning buildings.....	4	38	.....	.....	.....	1	.....	.....	.....	.....	15 00	.....	.....
Blasting.....	1	1	.....	3	.....	.....	.....	.....	.....	.....	50 00	.....	.....
Burning rubbish.....	1	3	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....
Lumberjacks.....	1	2	.....	.....	.....	30	.....	.....	.....	.....	.....	.....	.....
Sawmill.....	1	30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Steam roller.....	1	45	.....	20	25	.....	.....	.....	.....	.....	50 00	.....	.....
Total Adirondacks.....	331	14,102	54	2,457	4,558	1,426	30	2,125	2,631	821	\$11,175 00	\$360 00	\$170 00	
CATSKILLS														
Locomotives.....	14	118	.....	7	1	110	.....	.....	.....	.....	\$100 00	.....	.....
Smokers.....	7	1,202	.....	880	65	257	.....	.....	.....	.....	.....	.....	.....
Fishermen.....	1	1	.....	.....	1	.....	.....	.....	.....	.....	80 00	.....	.....
Hunters.....	10	501	.....	121	355	25	.....	.....	.....	.....	10 00	.....	.....
Campers.....	1	1	.....	1	.....	.....	.....	800	80	.....	550 00	\$80 00	.....
Incendiary.....	3	1,680	.....	780	50	20	.....	.....	.....	.....	.....	.....	.....
Burning brush.....	3	75	.....	.....	.....	25	.....	.....	.....	.....	.....	.....	.....
Berry pickers.....	2	1	.....	.....	.....	1	.....	.....	.....	.....	100 00	.....	.....
Children.....	4	30	.....	20	8	2	.....	.....	.....	.....	.....	.....	.....
Burning buildings.....	1	100	.....	50	50	.....	.....	.....	.....	.....	100 00	.....	.....
Blasting.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total Catskills.....	47	3,709	.....	1,859	530	440	.....	800	80	.....	\$040 00	\$80 00	.....
TOTALS														
Adirondacks.....	331	14,102	54	2,457	4,558	1,426	30	2,125	2,631	821	\$11,175 00	\$360 00	\$170 00	
Catskills.....	47	3,709	.....	1,859	530	440	.....	800	80	.....	940 00	80 00	.....
Grand totals.....	378	17,811	54	4,316	5,088	1,866	30	2,925	2,711	821	\$12,115 00	\$440 00	\$170 00	

* Less than one acre burned.

FIRES REPORTED FROM OBSERVATION STATIONS IN 1920, AND VISITORS REGISTERED

STATIONS	Fires reported, 1919	Fires reported, 1920	Visitors registered, 1920
Adams.....	3	4	35
Ambersand.....	8	8	672
Arab.....	3	2	327
Azure.....	23	7	188
Bald.....	8	21	105
Balsam Lake.....	4	6	144
Beaver Lake.....	7	8	55
Belfry.....	2	5	160
Bellevue.....	3	1	1,131
Black.....	2	4	1,501
Blue.....	4	21	2,800
Boreas.....	3	6	38
Cat.....	14	16	288
Catamount.....	15	18	317
Cathead.....	5	22	160
Crane.....	5	16	164
DeBar.....	4	3	104
Fort Noble.....	1	1	50
Gore.....	3	5	84
Hadley.....	4	20	100
Hamilton.....	3	25	557
High Point.....	5	19	195
Hunter.....	2	1	371
Hurricane.....	7	2	211
Kempehall.....	4		250
Loon Lake.....	4	5	22
Lyon.....	3	3	64
Makomis.....	3	6	175
Mohonk.....	3	16	91
Moosehead.....	15	17	180
Moose River.....	5	1	75
Mount Morris.....	8	7	200
Owlshead.....	6	14	671
Pharaoh.....	5	14	640
Poke-O-Moonshine.....		4	764
Prospect.....	5	15	1,400
Red Hill ¹		3	356
Rondaxe.....	9	10	5,878
St. Regis.....	5	5	552
Snowy.....		14	492
Stillwater.....	17	21	196
Swede.....	4	7	75
Tupper Lake.....		4	100
Tomany.....	1	4	171
Tooley Pond.....	2	15	124
Tremper.....	6	3	827
Twadell.....	3	7	215
Vanderwhacker.....	6	6	82
Wakeley.....		7	28
West.....	5	7	340
Whiteface.....	10		263
Woodhull.....	7	11	187
Total.....	274	467	24,175
Long Island			
Flanders.....	29	41	60
Telescope.....	134	143	84
Clock ¹		19	
Grand total.....	437	670	24,319

¹ In operation part of season only.

FOREST FIRES, 1920, SUMMARY BY MONTHS AND COUNTIES

COUNTY	Month									
	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Tot.
ADIRONDACKS										
Clinton.....	14		10	9	1	2	1	4		41
Essex.....	2	15	25	8	5	15	5	10		85
Franklin.....		2	9	7	1	7	2	1	1	30
Fulton.....		1								2
Hamilton.....			14	4	1		2	19		43
Herkimer.....		2	10	2		2		4		20
Lewis.....			10	2			1	2		15
Oneida.....		1	3	1	1					6
St. Lawrence.....		1	22	8	5			5		41
Saratoga.....			2			1	1	2		6
Warren.....		1	13	6		5		14		40
Washington.....			1				1			2
Total, Adirondacks..	16	23	119	47	14	35	14	62	1	331
CATSKILLS										
Delaware.....	2	4		5	1			1		13
Greene.....		1						2		3
Sullivan.....		2						1		3
Ulster.....		4	11	2	3	2		5	1	28
Total, Catskills.....	2	11	16	3	3	2		9	1	47
TOTALS										
Adirondacks.....	16	23	119	47	14	35	14	62	1	331
Catskills.....	2	11	16	3	3	2		9	1	47
Grand total.....	18	34	135	50	17	37	14	71	2	378

TREES PLANTED IN NEW YORK STATE 1901-1920

	State institutions	State land	Total State	Total private	Total per year
1901-1908.....		2,186,000	2,186,000		2,186,000
1909.....		90,000	90,000	1,005,000	1,095,000
1910.....		44,000	44,000	1,700,000	1,744,000
1911.....		120,000	120,000	1,670,000	1,790,000
1912.....	500,000	1,346,000	1,846,000	2,978,000	4,824,000
1913.....	804,000	76,000	880,000	3,242,000	4,122,000
1914.....	903,000	1,094,000	2,002,000	2,609,000	4,611,000
1915.....	1,156,460	3,030,000	4,171,450	3,712,675	7,984,125
1916.....	823,784	2,874,900	3,698,684	3,047,600	6,746,284
1917.....	1,065,800	4,019,120	5,084,920	1,636,215	6,721,135
1918.....	426,000	4,213,000	4,639,000	2,597,785	7,236,785
1919.....	107,000	5,160,100	5,267,900	2,265,055	7,532,955
1920.....	51,500	1,257,425	1,308,925	2,470,475	3,779,400
Total.....	5,843,344	25,510,545	31,408,879	29,033,805	60,372,684

LAND ACQUIRED

From Jan. 1, 1920, to Dec. 31, 1920

ADIRONDACK PRESERVE

ESSEX COUNTY

Essex Tract

ACRES

Lot No. 175.....	160 00
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Jay Tract

Lot No. 23.....	142 00
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Lot No. 51.....	393 60
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Old Military Tract

Township No. 1

THORN'S SURVEY

Lot No. 110.....	138 00
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Townships Nos. 1 and 2

RICHARD'S SURVEY

Lot No. 23.....	228 00
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Township No. 11

Lot No. 114, S. E. 1/4, part	25 00
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Lot No. 131.....	160 00
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Lot No. 132.....	160 00
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Lot No. 151.....	160 00
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Lot No. 152.....	160 00
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Lot No. 189.....	160 00
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Lot No. 190.....	160 00
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Lot No. 210.....	160 00
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Lot No. 229.....	160 00
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Paradox Tract

Lot No. 241.....	160 00
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Lot No. 242.....	149 40
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Lot No. 257.....	149 40
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Lot No. 258.....	160 00
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<i>Totten & Crossfield Purchase</i>		ACRES
Gore around Lake Colden.....		7,740 80
Township No. 50		
Lot Nos. 62 & 63.....		194 50
Lot No. 64.....		160 00
Lot No. 78.....		160 00
Lot No. 79.....		160 00
Lot Nos. 80 & 81		195 50
Lot Nos. 82 & 83.....		196 80
Lot No. 84.....		160 00
Lot No. 85.....		160 00
Lot No. 86.....		160 00

FRANKLIN COUNTY

Macomb's Purchase, Great Tract One

Township No. 27

N. W. $\frac{1}{4}$ South end.....	2,705 48
South half, ex. 51.65 a. S. E. cor.....	15,214 52

FULTON COUNTY

Chase's Patent

Lot No. 41.....	100 00
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Glen, Bleecker & Lansing Patent

Lot No. 32.....	767 00
Lot No. 33, W. end.....	212 00
Lot No. 35, Sub. 5.....	100 00
Lot No. 35, Sub. 8.....	100 00
Lot No. 35, Sub. 9.....	94 50

HAMILTON COUNTY

Benson Township

Lot No. 163, und. $\frac{1}{2}$	80 00
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Totten & Crossfield Purchase

Township No. 31

GORTON TRACT

Lot No. 20.....	131 00
Lot No. 21.....	131 00

HERKIMER COUNTY

*Adgate's Eastern Tract*Miller (J. A.) Tract ACRES

Lot No. 1.....	100 00
Lot No. 18, ex. N. W. cor. 25 a.....	75 00
Lot No. 20, ex. 60 a. W. end.....	40 00

Jerseyfield Patent

Lot No. 80, N. E. cor.....	123 50
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Nobleboro Patent

New Survey

Lot No. 20.....	150 00
Lot No. 50.....	150 00
Lot No. 51.....	150 00

Old Survey

Lot No. 4.....	300 00
Lot No. 5.....	300 00

Remsenburgh Patent

Lot No. 48.....	500 00
Lot No. 49.....	500 00
Lot No. 50.....	500 00
Lot No. 53.....	554 85
Lot No. 55.....	500 00
Lot No. 62.....	500 00
Lot No. 71.....	349 00

Vrooman's Patent

Lot No. 1 S. W. corner.....	126 88
Lots Nos. 3 and 4, S. E. parts.....	52 58
Lots Nos. 7 and 14, S. W. corner.....	221 58

ST. LAWRENCE COUNTY

Macomb's Purchase

Great Tract 2

TOWNSHIP No. 1

ACRES

S. W. $\frac{1}{4}$ Ex. 4,000 a. E. part and ex. 300 a. sq. S. W. corner and water	3,640 00
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TOWNSHIP No. 4

N. W. $\frac{1}{4}$	7,605 00
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Great Tract 3

TOWNSHIP No. 10

N. W. $\frac{1}{4}$, S. $\frac{1}{2}$	4,023 00
S. E. $\frac{1}{4}$	7,794 00
S. W. $\frac{1}{4}$	7,520 00

TOWNSHIP No. 14

N. W. $\frac{1}{4}$ ex. 37. 31-a. on S. W. line.....	7,335 69
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CATSKILL PRESERVE

DELAWARE COUNTY

Hardenburgh Patent

Great Lots Nos. 7 and 10

DARLING'S FIRST SURVEY

Lot No. 4, E. part.....	62 00
Lot No. 5	166 00

GREENE COUNTY

Hardenburgh Patent

Great Lot No. 22

Lot No. 76, N. $\frac{1}{2}$ E. of brook.....	108 25
Lot No. 77, N. $\frac{1}{2}$	123 75

Great Lot No. 24

East Division

West Part

ACRES

Lot No. 59.....	138 72
Lot No. 65.....	140 00
Lot No. 66.....	140 00
Lot No. 67.....	140 00
Lot No. 68.....	140 00
Lot No. 69, All in Greene Co.....	115 00
Lot No. 71, All in Greene Co.....	25 00

West Division

Parcel B'd E. & S. by State.....	32 08
Parcel B'd E. by E. Div., N. by State.....	40 10
Parcel B'd E. by Myrtle Hollow Brook, S. and W. by State	28 00
Parcel B'd E. by Kibby Brook, W. by State.....	19 00

Thousand Acre Tract

North part	283 93
South part in Greene Co.....	177 00

State Land Tract

Lot No. 40, S. E. corner.....	30 60
Lot No. 52, S. E. corner.....	255 00
Lot No. 78, All in Windham.....	145 40

ULSTER COUNTY

Hardenburgh Patent

Great Lot No. 6

DENNING TRACT

Lots Nos. 83, 97 & 98, parcel in.....	131 50
Lots Nos. 95, 96 & 103, parcel.....	162 55
Lots Nos. 103 & 114, parcel in.....	179 00
Lot No. 112, parcel in.....	40 00
Lot No. 134.....	180 00

Great Lot No. 7

EASTERLY END		ACRES
Krum Lot, S. E. corner.....		75 00
GARRETSON TRACT		
Lot No. 19		237 00
Lot No. 56		241 00
Lot No. 130, S. W'ly end.....		100 00

Great Lot No. 8

Allotment bet. Yankcetown and Little Shandaken

Lot No. 13	483 58
Lot No. 16, parcel in.....	173 73

Joanna Livingston or Sherwood Tract

S. W. Cor. Sherrill Lot, ex. 81 a. S. W. part.....	2,344 00
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Great Lot No. 24

East Division

West Part

Lot No. 69, all in Ulster Co.....	46 00
Lot No. 70	140 00
Lot No. 71, all in Ulster Co.....	115 00
Lot No. 72.....	140 00
Lot No. 73.....	140 00
Lot No. 74.....	159 35
Lot No. 75.....	159 74

WEST DIVISION

Thousand Acre Tract

S. W. part in Ulster Co.....	350 66
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Rochester Patent

Mary Elmendorf Tract

Lots Nos. 1 and 2.		
Parcel of		1,911 60
Parcel of		51 00
Parcel of		21 50

FOREST PRODUCTS IN 1919

In accordance with Section 58 of the Conservation Law, statistics of the amount of lumber manufactured and round wood consumed from the forests in the State during the calendar year of 1919 have been collected and are given below:

Owing to the fact that the U. S. Bureau of Census was interested in the collection of this information, which it has been the custom of this Commission for many years to collect, and inasmuch as it desired additional information, a cooperative plan was entered into whereby a questionnaire of the Census Bureau was sent to all of the manufactures desired, and these figures were copied by the Census Bureau and tabulated and through this cooperative plan forwarded to us for publication, as in the past.

Lumber	<i>Feet B. M.</i>
Hemlock.	76,252,000
Pine	48,588,000
Spruce	23,951,000
Balsam	2,606,000
Cedar	266,000
Tamarack	74,000
Maple	61,261,000
Beech	40,256,000
Birch	31,573,000
Oak	24,317,000
Chestnut	14,338,000
Basswood	11,620,000
Elm	6,093,000
Ash	5,100,000
Cherry	1,768,000
Hickory	696,000
Walnut	491,000
Poplar.	495,000
Minor Species	287,000
	<hr/>
	350,032,000

Round Wood		<i>Cords</i>
Spruce pulpwood		345,164
Balsam pulpwood		32,986
Hemlock pulpwood		56,818
Poplar pulpwood		32,236
Basswood pulpwood		20,518
		<hr/>
		487,722
Wood for acid, excelsior, kilns, etc.		167,350
		<hr/>
Total cords		655,072
		<i>Feet B. M.</i>
Equivalent B. M. of cordwood		359,634,528
Lumber		350,032,000
		<hr/>
Total of lumber and round wood		709,666,528

Pieces	
Shingles	4,586,000
Lath	3,191,000
Heading	2,483,000
Staves ,	41,333,000

Forest Products by Years	<i>Feet B. M.</i>
1908	1,226,754,365
1909	1,091,164,710
1910	927,933,291
1911	972,596,685
1912	942,545,269
1913	851,391,367
1914	855,658,389
1915	804,142,388
1916	863,932,860
1917	861,870,781
1918	762,289,934
1919	709,666,528

DIVISION OF WATERS

[201]

Albert H. Perkins.....	Division Engineer
Alexander Rice McKim.....	Inspector of Docks and Dams
Edward H. Sargent.....	Senior Assistant Engineer, Water Power, Storage and Drainage
Russell Suter.....	Senior Assistant Engineer, Water Supply and Sewerage
Frank H. Macy.....	Assistant Engineer
Frank D. Porter.....	Assistant Engineer
Charles H. Hurley.....	Assistant Engineer
Hollister Johnson.....	Assistant Engineer
Ivan C. Hall.....	Assistant Engineer

DIVISION OF WATERS

WATER POWER DEVELOPMENT

Since the last report to the Legislature, Congress has passed the Federal Water Power Act, approved by the President on June 10, 1920. This act vitally affects the water power situation in the State of New York. Its purpose as affecting the State would appear to be the removal of any obstacle to the development of power which could be removed by Federal action, reserving to the State the control of rates through its Public Service Commission; likewise the opportunity to so legislate that any excess profits will, upon the passage of proper laws, revert to the State, and also reserving to the State the right to charge rentals for the use of any of its rights and properties employed in the development of a project.

The act in requiring, as a prerequisite to the issuance of a license, evidence of full compliance with all State laws, affords the State the opportunity of taking full advantage of the reservations above noted, as well as to adequately protect the interests of the people of the State in their water powers, if prompt legislative action is taken.

Twelve applications for Federal license affecting the St. Lawrence and Niagara Rivers have already been filed with the Federal Power Commission. The importance of prompt legislative action cannot be too strongly emphasized, since there is danger, in the absence of legislative action, or control, that valuable rights may be lost to the State, or the whole situation so complicated as to indefinitely postpone the prompt development of the State's water powers.

The underlying principles of the Federal Water Power Act are that the Federal government will give to licensees such authority as it possesses for the development of water power, upon condition that the licensee will develop the power and use it, or sell it at a price which will return to the licensee, within the license period, the moneys invested, together with a fair return upon the actual investment, and nothing more. The charges of the United States government are confined to such nominal fees as will pay the costs of administering the law and

a reasonable, annual charge for the use of government property, where such property is used. There is no charge by the United States government for the use of State-owned property, or for the use of raw water power as such. The law provides that excessive profits shall be expropriated to the United States government "until the respective States shall have made provision for



NIAGARA FALLS

preventing excessive profits or for the expropriation thereof to themselves," etc.

The return to the investor is to be based upon the "net investment," which is defined in the act practically as the amount of money originally invested, or put in later for betterments, less all sums accrued in the surplus, amortization, depreciation, or other similar accounts; and the law provides further, that, at the end of the license period, the Federal government may recapture

by paying what is then the "net investment." It will thus be seen that the Federal bill will require an accurate supervision of accounts to determine the net investment, and to indicate whether or not a fair return is being earned upon it. This requires that there shall be a sharp separation line drawn around the investment in generating and transmitting apparatus, separating these elements distinctly from the plant or plants where the power is used, or from the distribution lines, and that there shall be, in all cases, some method of determining the price at which the power shall be delivered to the user, or sold to the distributor.

A careful reading of the act will indicate that in order to make it operative for all localities, and open to use by all citizens, it must be supplemented by State legislation. So there are two reasons why the State should enact legislation with the greatest promptitude:

First: To protect the rights of the State in its water powers, and to secure to the State and its citizens all of the benefits which the Federal Water Power Act contemplates shall accrue to it, or them.

Second: To so supplement the Federal Act as to enable State officers to perform those acts which are properly State functions, but will be performed in conformity with the principles embodied in the Federal Water Power Act, and that the Federal Act may be made workable to the fullest possible extent.

The Commission repeats its recommendation to the Legislature of last year that a commission, as defined by article VII-A of the Conservation Law, composed of the Conservation Commissioner, the State Engineer and Surveyor and the Attorney-General, would be well adapted to execute the new legislation. It further recommends that the bill shall provide for the licensing by the State of all water power projects in which the State has a proprietary interest. The new legislation should be designed to harmonize with the Federal Water Power Act, and the Public Service Commission's jurisdiction should be extended so that, as a contract feature of the license, it shall have power to fix rates at which the power shall be sold by the licensee to the user or distributor, whether the power enters into the public service or not.

While this may necessitate a slight difference in the form of

the legislation advocated by this Commission in its last annual report, the underlying principles are the same, and may be again briefly summarized as follows:

First: The immediate development of the dormant water powers so that this great asset may be placed, without further loss of time, at the service of the industries of the State;



MOHAWK RIVER AT COHOES.

Second: To assure to the State a direct and an adequate return for its rights and properties utilized;

Third: Regulation of rates for power by the Public Service Commission.

Fourth: A recapture clause under which after a reasonable period of time, wherein the invested capital shall have received adequate return, the State, should it in its wisdom so determine, may acquire the developed project on a fair basis.

NIAGARA FALLS POWER COMPANY RENTAL

Chapter 596 of the Laws of 1918 authorized the consolidation of Cliff Electrical Distributing Company, The Niagara Falls Power Company and The Hydraulic Power Company of Niagara Falls. Chapter 597 of the Laws of 1918 authorized any new corporation, constituted by the consolidation authorized by the previous statute, "efficiently to utilize any water by it lawfully

diverted from the Niagara River," and contained, among others, the following provision:

Provided further that if the corporation constituted by such consolidation shall divert from the Niagara river for power purposes more than fifteen thousand one hundred cubic feet per second, there shall be reserved to the state the right to charge an equitable rental therefor in such amount and in such manner as shall hereafter be provided by law.

The Niagara Falls Power Company was incorporated October 31, 1918, to take over the rights and privileges of the three above named companies, and proceeded to enlarge the canal of the Hydraulic Power Company and to construct a new power house in which has been installed three new units of a capacity of 37,500 horsepower each, in order to utilize the additional diversion authorized by the last named chapter. The Niagara Falls Power Company is now diverting and using 4,400 cubic feet per second in addition to the 15,100 cubic feet per second above referred to.

The Conservation Commission respectfully urges the enactment of legislation directing the Niagara Falls Power Company to pay to the Treasurer of the State of New York such an equitable rental for the use of the 4,400 cubic feet per second, which the said company is diverting, as shall be determined by the Commission.

ALUMINUM COMPANY RENTAL

Under date of July 5, 1918, the St. Lawrence Power Company, which is a subsidiary of the Aluminum Company of America, applied to the International Joint Commission for permission to construct and maintain a submerged weir in the south channel of the St. Lawrence river near the entrance of the company's power canal near Massena, N. Y. It was represented to that Commission that serious interference had been experienced with the operation of the power plant during the winter months from ice blocking the south channel and almost entirely cutting off the flow of the water into the power canal, and that the construction of the proposed weir would permit the continuous operation of the plant, the aluminum output of which was most urgently needed for military purposes in prosecuting the war. The company further stated



HUDSON RIVER AT SPIER FALLS.

that the effect of the construction of the proposed weir would be to improve winter conditions without affecting materially the diversion of water, or navigation or water levels on the Canadian side of the St. Lawrence river.

The St. Lawrence Power Company is operating under a charter granted by chapter 484 of the Laws of 1896 authorizing the company "to construct, maintain and operate a canal or canals from the St. Lawrence river * * * and extending to, through, or over the lands intervening between said points and the Grass River," and the said company is developing 86,000 horsepower, by the use of the water thus diverted, at their plant at Massena. On September 14, 1918, the International Joint Commission made its decision ordering the approval of "* * * the construction of the said weir and its maintenance until the expiration of the term of five years from the date hereof, or until the termination of the present war * * *." In accordance with this permission the weir was built by the St. Lawrence Power Company in the fall of 1918.

The Conservation Commission and its engineers have inspected the weir and have studied the matter in its various aspects and have reached the conclusion that the construction and maintenance of the weir is an invasion of the property rights of the State of New York, but that it is to the general public welfare that the weir remain undisturbed, provided an adequate rental be paid therefor to the State of New York under a proper leasing or licensing scheme, which will further provide for a recapture of the rights and privileges of the State, which are utilized, at such time as it may be deemed to the best interests of the State so to do. We respectfully urge legislation to that end.

WATER POWER AND STORAGE SURVEYS

The surveys and investigations of the water power resources of the State have been pressed during the past year with as much vigor as finances permitted. The high value of the work to the people of the State is shown by the fact that requests are received daily for information obtained by the Commission's engineers in the course of its studies of the power and storage possibilities

of the Allegheny, Ausable, Beaver, Black, Chateaugay, Chazy, Delaware, Genesee, Grass, Hudson, Indian, Mohawk, Moose, Niagara, Oswegatchie, Oswego, Raquette, Sacandaga, St. Lawrence, St. Regis, Salmon, Saranac, Schroon, and Susquehanna rivers, and the Barge Canal and the Commission's engineers are in frequent consultation with engineers who wish to utilize the data obtained.

Ausable River. The report on the power and storage possibilities of the Ausable River has been completed and is being published as an appendix to the bound volume report of the Commission for 1919. A brief summary of this report is given below.

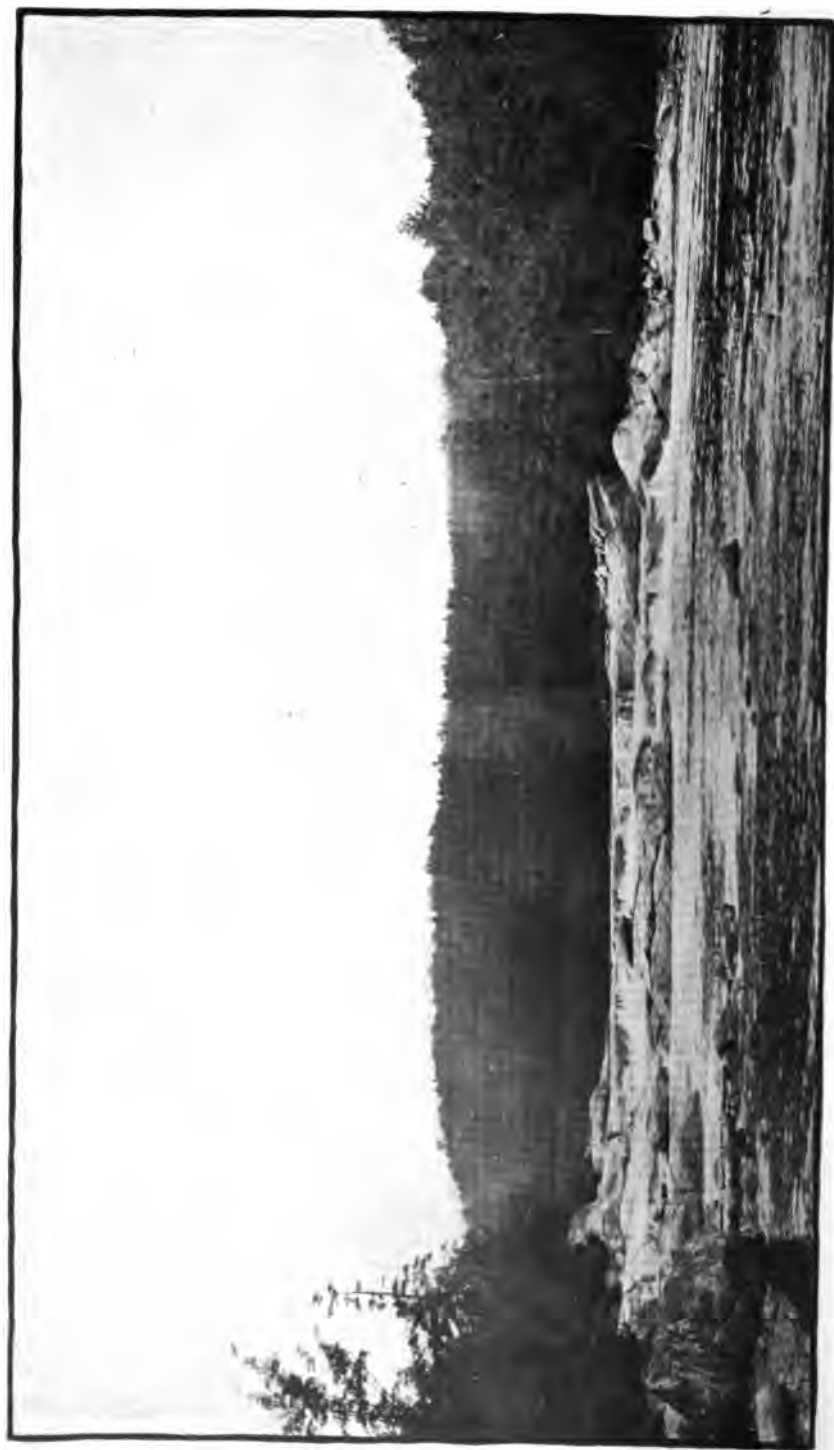
The Ausable River has a drainage area of 518 square miles at its mouth, the west branch has a drainage area of 235 square miles at its junction with the east branch at Ausable Forks and the drainage area of the latter at this point is 199 square miles. There is a total fall from the upper Ausable Lake to Lake Champlain of 1895 feet through a distance of 49 miles. Of this fall 860 feet occurs in the first four miles below the lower Ausable Lake, and 130 feet in the Ausable Chasm. The flow of the Ausable River covers a wide fluctuation, showing a great need of storage. The surveys and studies disclosed only one large reservoir which would be feasible of construction, the proposed Cherry-patch Pond Reservoir, which would be created by the construction of a dam 95 feet high about 11½ miles above Wilmington Notch. This reservoir would have a capacity of 2,500,000,000 cubic feet. The present developments on the Ausable River total 6,426 horsepower and the economic installation, if the Cherry-patch Pond Reservoir were built, would be 31,283 horsepower. It might be mentioned that no power development is recommended, for the present at least, in the Ausable Chasm as the need for water to preserve the charm of the scenic beauty of the Chasm far outweighs the demands for power.

Hudson River Survey. Much data has been obtained since the last report of the power possibilities of the Hudson River was issued and it is planned to publish a new report on this stream.

During the past season a survey had been made of the Gooley Reservoir. This reservoir could be created by the construction



AUSABLE RIVER — FALLS AT ENTRANCE TO AUSABLE CHASM



MOOSE RIVER AT LYONSDALE

of a dam on the Hudson River either just below its junction with the Indian River or immediately below the junction of the Cedar and Hudson Rivers. It will not be possible to ascertain which of these two plans will be the more feasible until our surveys and estimates are completed. In either case it is possible to obtain the 12 billion cubic feet of storage, which is necessary in addition to the present storage of 5 billion cubic feet of the existing Indian Lake Reservoir, to practically completely control the Hudson River at its junction with the Indian River. This project is an alternative to the previously proposed project of enlarging the present Indian Lake Reservoir to 10 billion cubic feet and obtaining 7 billion cubic feet by the Ords Falls Project.

BLACK RIVER REGULATING DISTRICT

Article VII-A of the Conservation Law, entitled "River Regulation by Storage Reservoirs," makes possible the creation of any watershed of the State into a river regulating district under the jurisdiction of a commission consisting of the Conservation Commissioner, the State Engineer and Surveyor and the Attorney General.

Pursuant to the provisions of this article, and as was noted in the Commission's report for 1919, the Black River Regulating District was created on August 14, 1919.

On March 23, 1920, the Board of the Black River Regulating District filed with the Commission a plan for the regulation of the flow of the Black River and certain of its tributaries, in accordance with Section 443 of the Conservation Law, and at a meeting of the Commission on April 20th the Commission adopted the following resolution:

"Resolved, that the General Plan for the Regulation of the flow of the Black River and certain of its tributaries, duly certified to, and filed with the Commission on March 23, 1920, by the Board of the Black River Regulating District, be and the same hereby is modified in the following respects and particulars:

Forestport Reservoir, proposed capacity, 4.21 bil. cu. ft.

Construction of this proposed reservoir disapproved.

Panther Mt. Reservoir, proposed capacity, 4.4 bil. cu. ft.

Panther Mt. Reservoir, proposed capacity, 8.0 bil. cu. ft.

Construction of this reservoir of a capacity not to exceed 4.4 bil. cu. ft. approved.

Higley Mt. Reservoir, proposed capacity, 3.6 bil. cu. ft.

No determination, either approving or disapproving this proposed reservoir, is made, it being deemed by the Commission advisable, because of the present lack of determining data, that the question of the approval or disapproval of the said reservoir should come before it at some future time in the form of an application for the amendment of the General Plan.

Old Forge Reservoir, proposed increased capacity from 0.49 bil. cu. ft. up to a total of 0.74 bil. cu. ft. by dredging the channel between Third and Fourth Lakes. Unanimously approved; with the limitation and upon the expressed condition that no part of the water stored in the existing or proposed reservoir shall be drawn off prior to the 15th day of September in any year, except on approval in writing by the Commission.

Stillwater Reservoir, proposed capacity, 1.9 bil. cu. ft.

Stillwater Reservoir, proposed capacity, 4.5 bil. cu. ft. Construction of this reservoir of a capacity not to exceed 4.5 bil. cu. ft. approved.

Lake Lila Reservoir, proposed capacity, 3.0 bil. cu. ft. Construction of this proposed reservoir disapproved.

Nelson Lake Reservoir, proposed capacity, 0.20 bil. cu. ft.

Minnehaha Reservoir, proposed capacity, 1.10 bil. cu. ft.

Sixth Lake Reservoir, proposed capacity, 0.90 bil. cu. ft.

Indian Rapids Reservoir, proposed capacity, 0.60 bil. cu. ft.

Big Moose Lake Reservoir, proposed capacity, 1.5 bil. cu. ft.

Pine Lake Reservoir, proposed capacity, 1.75 bil. cu. ft.

No determination is made either approving or disapproving the construction of these reservoirs, inasmuch as the feasibility of their construction on the sites named may be better considered at some future time by an amendment of the General Plan, upon proper application made by the Board of the Black River Regulating District to the Commission, after the obtaining by said Board of more data relative to their feasibility, and be it further



AUSABLE RIVER — THE FLUME

"Resolved, that the aforesaid General Plan for the Regulation of the Flow of the Black River and Certain of its Tributaries, as filed with the Commission on March 23, 1920, by the Board of the Black River Regulating District, be modified as afore stated, and that, as so modified, it be and the same hereby is in all respects approved."

The Board of the Black River Regulating District submitted on December 9, 1920 to the Commission provided for by Article VII-A of the Conservation Law, in accordance with the provisions of section 467 of the Conservation Law, its annual report. A summary of this report is given below.

As directed by the above mentioned statute, the report was divided into the following subdivisions:

1. An exhibit of the personnel of the Board and all of the employees and persons connected with the Board.
2. A financial statement showing the finances of the District.
3. A statement of the petitions received by the Board and the action taken thereon.
4. A descriptive statement of the work done during the previous year.
5. A statement of the condition of reservoirs and the results secured by the operation thereof.
6. An appendix giving further details as deemed proper by the Board.

The Board of the Black River Regulating District, which was appointed on September 6, 1919, by Governor Smith, consists of

J. Victor Baron, Chairman, term of five years.

John B. Taylor, term of four years.

James A. Outterson, term of three years.

The law provides that the construction of reservoirs and other work of the Board shall be financed by temporary certificates of indebtedness which shall be repaid from the sale of bonds at a later date. No such work has yet been undertaken and no certificates or bonds have been issued. Current expenses, such as salaries of employees, telephone service and office supplies and equipment, have been paid by Taggarts Paper Company.



MOOSE RIVER AT KOSTERVILLE

Northern New York Utilities, Inc., and Carthage Sulphite Pulp and Paper Company. The total amount thus paid to June 30, 1920 was \$5,198.75. These expenses will be assumed by the Board and repaid when the proceeds from the sale of certificates become available.

On September 1, 1920, a petition was received from the town board of the town of Webb, Herkimer county, requesting that the Board provide for and assume the expense of the rebuilding and reopening of the old Carthage and Lake Champlain highway, which formerly crossed the southerly branch of the Stillwater reservoir. Action on this petition has been deferred pending the completion of plans for the Stillwater reservoir.

As stated hereinbefore in the report of the Conservation Commission, the Black River Regulating District prepared a general plan for the regulation of the flow of the rivers of the district, which was adopted by the district on March 22, 1920, and certified to the Commission on the same date, and was approved with modifications on April 20, 1920. The Black River Board decided to begin its program of reservoir construction by enlarging the existing Stillwater reservoir on the Beaver river. It is proposed to raise the Stillwater dam about six or seven feet and thus approximately double the capacity of the reservoir. The necessary preliminary surveys and investigations were made in the course of the past summer. It is expected that the preliminary plans and specifications for the enlargement of this reservoir will be submitted to the Commission at an early date.

The existing reservoirs, at Stillwater on the Beaver River, and at Old Forge and Sixth Lake on the Middle Branch of the Moose River were taken over by the Board July 1, 1920, and, since that date have been operated by the Board. Two new steam gaging stations have been established in cooperation with the United States Geological Survey, one on the Beaver River at Tiss Bridge near the Village of Croghan and the other on the Black River in the City of Watertown.

A statement is given of the condition of the existing reservoirs and attention is called to the restriction on the use of the Old Forge Reservoir due to the location of the pipes which supply water to the State Fish Hatchery. Two pipes lead from the

reservoir dam to the Fish Hatchery, which is located immediately below the dam, and the entrance to the highest pipe is only about 2.4 feet below the crest of the dam. This makes it impossible to supply the full quantity of water to the hatchery if the reservoir is drawn more than two feet below the crest of the dam, and results in the disuse of about one-third of the capacity of the reservoir. The Conservation Commission plans to install a pumping plant in the Fish Hatchery for use during the period when the reservoir may be drawn down.

Although the past season has been exceptionally dry, the results of the operation of the Stillwater and Fulton Chain Reservoirs have been highly gratifying. Late in May, 24-inch flashboards were placed on the Stillwater Dam, and 18 inches of additional storage was obtained by June 5, when it became necessary to begin drawing upon the stored water. About 200,000,000 cubic feet of water was thus obtained. The reservoir was steadily drawn upon until July 6, when a heavy rain permitted the closing of the gates for a few days and the storage of about 200,000,000 cubic feet of water in the reservoir. On two or three other occasions summer rains permitted the closing of the gates and the impounding of small quantities of water which otherwise would have gone to waste.

The practice was to keep a careful watch of weather conditions throughout the whole district, and as soon as the water in the river began to rise after a rain, the gates at Stillwater were wholly or partly closed until the effect of the rain had passed off. Dry weather continued until about November 1, on which date the reservoir was very nearly empty. During November rains have been frequent and the reservoir has been slowly filling. On November 30, the reservoir had filled to within about 2.7 feet of the crest of the dam. It is hoped that it will be possible to completely fill the reservoir before the winter drought begins.

Briefly summarized, the operation of the Stillwater Reservoir has been as follows:

Capacity of reservoir, 900 mil. cu. ft.

Impounded by means of flashboards, 200 mil. cu. ft.

Total storage capacity with flashboards, 1100 mil. cu. ft.

Total quantity withdrawn from reservoir, 1360 mil. cu. ft.



BEAVER RIVER AT HIGH FALLS

Total quantity restored (November 30), 890 mil. cu. ft.

Quantity in reservoir November 30, 630 mil. cu. ft.

One and one-half times the capacity of the reservoir has been used in course of the summer and two-thirds of its capacity remains for use during the winter drought.

Owing to the restrictions on the use of the Fulton Chain reservoirs, the operation of the Old Forge and Sixth Lake reservoirs has not been so efficient. The Sixth Lake reservoir was emptied during the last week of July and the first week of August to permit the rebuilding of the dam by the Conservation Commission. The reservoir remained empty the remainder of the season and until the completion of the dam, late in November. The gates in the new dam have now been closed and the reservoir is slowly filling.

The Old Forge Reservoir was maintained full until the close of the navigation season, about September 12. The gates were then opened and the entire available capacity of the reservoir above the fish hatchery pipes was used during the months of September and October. The gates were closed about November 1, and the reservoir has been slowly filling since that date. About 80 million cubic feet of water had been restored on November 30.

CANASERAGA CREEK IMPROVEMENT

The certiorari proceedings to review the Commission's determination of benefits in the Canaseraga Creek Improvement Project were continued before the Hon. Herbert A. Hemingway, Referee, and the testimony completed on June 12, 1920. The hearings have extended over a period of four years and 5,926 pages of testimony taken. Three hundred and seventy exhibits were offered. Briefs have been submitted by the plaintiff and a reply thereto made on behalf of the defendant.

The 1920 Legislature appropriated funds to meet the financial obligations of the district for the year ending June 30, 1921, pending a decision in the certiorari proceedings, and for maintenance and expenses of litigation.

Maintenance work has been continued during the year, consisting of pile and brush bank protection work, elimination of



BEAVER RIVER AT BELFORT.

gravel deposits in the channels, repair of embankments and cleaning out lateral ditches by explosives. On account of the high cost and difficulty of securing labor the Commission's engineers have again recommended the purchase of a small caterpillar traction drag line excavator for the purpose of maintaining the project more economically. The Commission, at a meeting held September 20, 1920, included an amount to cover the purchase of such a machine in the budget of expenses for the year 1921.

DRAINAGE

The number of petitions received by the Commission and areas involved continue to be in excess of what can be surveyed by the Commission with the funds available. The Commission is adopting the course of making reconnaissances by its engineers and eliminating any infeasible projects as far as can be done safely by such reconnaissances. Also, in other cases, the survey is limited to securing only sufficient data to determine the cost of the whole project and the total amount of land benefited, without trying to determine the individual shares of the cost nor the exact nature of the secondary drainage ditches required to reach each individual. A report of this nature enables the owners to determine whether they are willing to bear the per acre cost, but of course is not of as much value to them as a full plan and report upon which they may later unite either under the Conservation Law or by voluntary association.

Orange County Project. The Commission received, on October 10, 1919, a petition signed by the owners of the swamp lands lying in the towns of Wallkill, Wawayanda, Goshen, Warwick and Minisink, praying that these lands be formed into the Orange County Drainage Improvement District. These lands have an area of about 17,000 acres and form perhaps the largest swamp in the State, excepting the Montezuma marshes. Most of the soil in this area is a fine quality of muck and on the outskirts of the swamp, which is partially drained, large quantities of onions, celery and lettuce are grown. Because of the fact that these lands lie adjacent to a large stream, the problem of protecting them from floods and draining them is unusually difficult. A

survey was made of the lands in question during the past season and estimates of cost of carrying out the project prepared and presented at a meeting of the land owners. At this meeting a referendum on the question of carrying out the project was taken and the owners felt that the costs were too high to warrant the work being carried out, so the project has been dropped, for the present at least. However, the investigations by the Commission have served to bring to a focus the needs for drainage and on one of the tributaries to the Wallkill River, Quaker Creek, considerable work is being done by the land owners themselves working cooperatively.

Porter-Lewiston Project. On July 19, 1919, there was filed with the Commission a petition signed by the owners of the majority of the lands in need of drainage along Four Mile Creek in the towns of Porter and Lewiston, Niagara County, praying that these lands be incorporated into a drainage improvement district. After a reconnaissance by the Commission's engineers, the Commission determined that the work was of sufficient importance to warrant the interference of the State and ordered a preliminary survey of the project. After the survey was completed, estimates were prepared showing the cost of carrying out the work and presented at a meeting of the land owners. As this project is of comparatively small magnitude, agitation was started at this meeting by the County Farm Bureau Manager to have the work done by the land owners themselves. The Commission, accordingly, dropped the project.

Capen Project. A petition was filed with the Commission on October 16, 1919, praying for the creation of the Capen Drainage Improvement District, in the towns of Wilson and Newfane, Niagara County. After a reconnaissance of this area was made by the Commission's engineers, the Commission determined that the work was of sufficient importance to warrant the interference of the State and, accordingly ordered a preliminary survey of the project, which has just been completed. Estimates of cost of carrying out the work will be prepared and presented to the land owners.

Mamakating Project. On August 24, 1920, there was filed with the Commission a petition signed by the owners of land in

the town of Mamakating, Sullivan County, N. Y., praying that a drainage improvement district be organized. An inspection of this project was made by the Commission's engineers and a preliminary estimate of cost was made, which showed that the cost of carrying out the work would be very high and that the resulting benefits would not warrant such an expenditure and, moreover, that it would be impossible at the present time to finance the project. The Commission accordingly determined that the carrying out of the project was not sufficiently conducive to public welfare to warrant the interference of the State and the project accordingly was dropped.

The Flats Project. A petition was filed with the Commission on April 1, 1918, praying for the creation of a drainage improvement district which would include about 250 acres of land in the town of Lisbon, St. Lawrence County. This land is good muck land and inadequately drained at the present time to permit of proper cultivation. After a reconnaissance of this area by the Commission's engineers, a preliminary survey of the project was ordered which has just been completed. Estimates of cost of this work will be prepared and presented to the land owners in the near future.

Tibbits Creek Project. A petition was filed with the Commission on April 26, 1918, praying for the creation of a drainage improvement district along Tibbits Creek in the towns of Lisbon and Oswegatchie, St. Lawrence County. After an inspection of this area, which is about 400 acres in extent, by the Commission's engineers a preliminary survey of the project was ordered, which has recently been completed and preliminary estimates of the cost of carrying out the work are being prepared for presentation to the land owners.

Reconnaissances. In response to the request of the respective land owners, the Commission's engineers have made reconnaissances for the following drainage projects: Naples, Ontario County; East Pembroke, Genesee County; Middletown, Orange County; and Ley Creek, Onondaga County. As proper petitions had not been filed in accordance with Article VIII of the Conservation Law, petition forms were sent to the land owners with the request that they have the same completed. The investigations disclosed in all the above cases projects which may be

feasible of being carried out, but which will require a survey to definitely decide this question. Upon the receipt of the petitions, surveys will be made of these projects.

Legislation. The Legislation Committee, appointed by the vice director of extension of the State College of Agriculture at Cornell University, of which the Division Engineer is a member, prepared amendments to Articles VIII and VIII-A of the Conservation Law in relation to drainage, which it was thought would make the law more workable. These amendments were adopted by the Legislature, and Article VIII as amended was re-enacted and became a law April 19, 1920, and Article VIII-A as amended was re-enacted and became a law April 12, 1920.

SUPERVISION OVER DOCKS AND DAMS

Jurisdiction over the docks and dams of the State is conferred upon the Conservation Commission by Section 22 of Article 3 of the Conservation Law. Briefly, this statute provides, with exceptions stated below, that no structure for the impounding of water, and no structure used as a landing place, shall be erected or reconstructed without notifying the Commission and complying with such conditions as it may prescribe for safeguarding life and property. Whenever public safety shall so require, power is also conferred upon the Commission to make and enforce an order requiring: (a) The submission of plans and specifications for proposed construction or reconstruction work; (b) the revision of such plans for proposed work; (c) the removal, repair or reconstruction of any existing structure; or (d) the completion of the necessary work in accordance with the plans and specifications approved by the Commission.

The structures excepted from our jurisdiction are as follows: (a) Any dam forming a part of the State's canal system; (b) any other where the area draining into the pond formed thereby does not exceed one square mile, unless the dam is more than ten feet in height above the natural bed of the stream at any point or unless the quantity of water which the dam impounds exceeds one million gallons; (c) any dock, pier, wharf or other structure under the jurisdiction of the department of docks, if any, in a city of the first class.

During the calendar year 1920, the Division of Waters has considered thirty applications for proposed dams. All plans and specifications submitted are given a thorough technical examination, which usually leads to requests for revisions, either through correspondence or an interview with the owner's representative. A report is then written, covering the information derived from such examination and an investigation of all sources of information readily available.

The location and inspection of existing structures was continued by six summer employees under the direction of the Inspector of Docks and Dams. The assistants locate the docks and the dams, and report their condition and certain measurements and other data required. The Inspector personally examines new structures and those reported unsafe. During the past year, one dam and ten docks have been condemned by the Commission and steps have been taken to have the same made safe.

With rare exceptions, the provisions of the Conservation Law relating to this subject have been cheerfully complied with. It seems highly desirable, however, that the section be further amended to enable the Commission to require the removal of channel obstructions, which would, in its judgment, cause the impounding of water or the diversion of the course of the stream, and thus endanger life or cause serious damage to the property of others.

WATER SUPPLY AND SEWERAGE

High prices for money, labor and materials and unsettled conditions in all markets have prevented the resumption of normal activity in water supply construction. During the year the Commission has received ten water supply applications and has acted on eleven such applications. A study of these cases indicates that, except for the abnormal weather conditions of the past winter, several of these would probably have been deferred to a later time. The winter of 1919 was peculiarly severe upon water supply systems. Many sources of supply were completely frozen up, while others failed in part. As a result of this condition many small villages have undertaken projects to increase their water supply resources. Of the ten applications received during 1920, six involve the acquisition of additional sources of supply;

one was for the taking over of a system built by the United States Government as a war activity and but one was for a comprehensive new system.

Activity in sewerage matters, as measured by the number of applications for approval of plans made to this Commission, has been about normal, some 100 cases having been acted upon. The great majority of these, however, are for treating trade wastes from small industrial plants and the sewage from school houses. Very few plans for comprehensive sewerage systems have been received, indicating that sewer construction is being deferred for the same reasons which have caused general stagnation in the building trades.

It seems evident that, if market conditions become stabilized and the prices of labor and materials recede from the present abnormal high levels, there should be great activity both in the water supply and sewerage fields, which should be reflected in the number of applications for approval of plans of such works submitted to this Commission.

HYDROGRAPHIC INVESTIGATIONS

The Commission has continued its systematic gaging of the flow of the streams of the State, pursuant to provisions of the Conservation Law, in cooperation with the U. S. Geological Survey and the State Engineer and Surveyor.

Appropriations for the use of these three bureaus have been pooled, as usual, and the work performed under the immediate direction of the District office of the United States Geological Survey.

Considerable financial assistance has been rendered by power companies, municipalities and private parties desiring information which was not available and which the funds appropriated were not sufficient to obtain.

During the past year the number of stations maintained was increased from 53 to 58. This increase in the number of stations was made possible by the increase in the appropriation for stream gaging work and also by the cooperation of outside parties. In some cases the cooperating parties have paid the entire cost of the new stations, equipping some of them with recording gages for

the records, and cable ways for making discharge measurements. Unfortunately, because of the limited appropriations, it is not possible to maintain an organization sufficient to meet the demands for cooperation, even on the very liberal terms offered by the cooperating parties.

Industrial conditions which have been developed during the past decade, have placed an increased value on water power and the unusual demand for stream flow records from all sections of the State is a marked indication of the fact that the scope of the investigations is not sufficient to meet the demands of the general public.

Dependable stream flow records, covering long periods of time, are the first requisite in studies for the development of water power and water supplies, and it is highly important that the stream flow work be continued and amplified during the coming year.

GENERAL ENGINEERING

Sixth Lake Dam. An appropriation was made by the Legislature of 1920, for the construction of a new dam at the foot of Sixth Lake of the Fulton Chain in the township of Inlet, Hamilton County. The original dam was built by the State to compensate the water powers on the Black River for the water diverted from the Black River watershed through the Black River Canal, south from the Forestport Reservoir. The Division of Waters prepared the plans, specifications and contract for the construction of a reinforced concrete dam to replace the existing timber dam, which was in a bad state of disrepair. The contract was let by the Commission and the construction of the dam has been completed during the past season. The appropriation item was \$22,000 and the work was completed within the contract price of \$17,889. A part of the balance will be used during the coming season for making more sightly the surroundings of the dam, which are on State land.

Burnham's Point Dock. The annual appropriation bill carried an item of \$5,500 for the construction of new docks on the St. Lawrence Reservation. It was decided to build a dock, replacing the existing dock, at Burnham's Point, where the Commission has a park and which is a locality greatly used for recreation pur-

poses. Plans were accordingly prepared, the contract let and the dock was completed in October under the inspection and supervision of the engineers of the Commission. The work was completed at a cost of \$4,736.10 and the balance of the item is being used in the construction of a small dock in the State park at Goose Bay.

Caledonia Hatchery. A provision was made in the annual appropriation bill for 1920 for the construction of sanitary accommodations at Caledonia Hatchery. The Commission's engineers prepared plans for the construction of two comfort stations at this hatchery and the work is being built by the hatchery force.

Constantia Marine Railway and Dock. The appropriation bill of 1920 contained an item of \$3,000 for the construction of a Marine Railway and Wharf at the Oneida Hatchery. Plans for this structure were prepared by the Division of Waters and, upon the approval of the Department of Architecture, this work was carried out under the direction of our engineers by force account, it being considered best, because of the peculiar nature of the work and because of the high bid submitted for one item, not to construct the work by contract. That our judgment was justified is shown by the fact that work was completed at a total cost of \$2,442.92. A timber wharf about 130 feet long was constructed on the left bank of Scriba Creek just below the State Highway Bridge in the village of Constantia, on lands acquired by the Commission. The Marine Railway is located adjacent to the wharf and extends down stream and has a total length of about 200 feet. A structural steel cradle was also designed and built for use in conjunction with the Marine Railway.

STREAM FLOW STUDIES

During the past year as time has permitted, the Division of Waters has made a number of general stream flow studies. Most of these were not made in reference to any particular project, but as more stream flow records become available it is possible to compute more accurate power and flow duration curves. It is proposed to publish as an appendix to the bound report of the Conservation Commission a series of duration flow curves for the principal rivers of the State together with the results of a special study of the comparison of duration flow curves computed from monthly flows and daily flows respectively.

DIVISION OF SARATOGA SPRINGS

DIVISION OF SARATOGA SPRINGS

J. G. JONES.....*Superintendent*
C. B. ELMORE*Secretary*
HERBERT ANT*Chemist*

DIVISION OF SARATOGA SPRINGS

BUSINESS OF THE YEAR

The State Reservation at Saratoga Springs has just experienced the most successful year in its history, in so far as the physical condition of the property and the patronage of the bath houses are concerned. The springs have maintained their mineralization and flow without diminution, their surroundings have been materially improved, and the new Washington Bath House, the most perfect and complete structure of its kind in this country, has been open for use in all departments and has met with universal satisfaction. Added to all of these physical features, there has been such an influx of visitors—earlier in the season than usual, during the height of the season, and after the time when Saratoga was formerly supposed to lapse into quietness—that there can no longer be any doubt that the State's wonderful mineral springs have taken the place in public esteem to which they are well entitled and which they formerly held without dispute. A more detailed discussion of this increased business will be found on the following pages.

In striking contrast to the increased business of the bath houses, with the financial return which it brings to the State for the large sums already expended, has been the experience with the bottling establishments, which were turned over to private operation on March 1st, under the terms of a lease executed by the former Commissioners of the State Reservation and recently upheld by a decision of the Court of Appeals. Under the terms of this lease, the Conservation Commission surrendered to the lessees on March 1st, in good running condition, property for which the People of the State of New York had paid upwards of \$435,000. With it the lessees took the records of the bottling business formerly conducted by the Commission and its commercial goodwill. From that time on, under the terms of the lease, the Commission has been required to keep all of these properties in general repair, minor repairs only being undertaken by the lessees. This has meant that the Commission has had to carry almost the same

force and expense as before the operation of the lease. The State's entire return for this property and for its care and maintenance was in the form of royalties, which in the period from March 1st to the close of the fiscal year on June 30, 1920, have amounted to \$1,163.99. Based on the business of preceding years, the State's income would have been at least \$20,000 more than this amount had it continued the operation of the bottling works and received the gross proceeds.

This means that the net profit from the income producing departments of the Reservation has been almost wiped out, and that hereafter a large part of the expense of carrying out the terms of the lease must be carried by the bath houses, or met by direct legislative appropriation.

FUTURE DEVELOPMENT

Recommendations for the future development of the State Reservation have been made to the Legislature in former reports of the Conservation Commission, and it has been pointed out that New York State owns in Saratoga the most wonderful collection of mineral springs with medicinal properties to be found anywhere in the known world. To permit such a resource to receive anything less than its full logical development, for the benefit of humanity in general as well as for the people of this State, is to lose one of the greatest opportunities for public service. The increased business which has come to the Reservation each year, by leaps and bounds, has proved conclusively the great need of cure facilities at Saratoga, and has shown that the public is ready and waiting for the time when New York State will provide them in adequate measure.

The Conservation Commission desires to repeat here the recommendation which it has heretofore made, that the Legislature authorize the construction of a bath house and other accommodations adequate to meet all demands.

During the last year a single new element has entered into this situation, to which it is necessary that careful consideration be given. The rush of applicants for the medicinal baths during the height of the season created an unprecedented drain upon the mineral springs supplying the Lincoln, Washington and Saratoga

Baths, with the result that the level of these springs was considerably lower toward the end of the summer. While the quality of the water was in no way impaired, the lowering of the water level nevertheless made it clearly apparent that additional springs must be piped to the bath houses. This need is being met. In this connection, however, the statistics showing the growth and number of mineral water treatments given each year for the last five years clearly suggests the possibility that the greatest future field of usefulness of the Saratoga waters is in the bath houses and drink hall and at the sources of the springs themselves. The Commission believes that all of these facts indicate plainly that Saratoga should be developed under State auspices as a great cure center, where patients afflicted with the variety of diseases which can be properly treated only at a cure center will find, under unified control, bath house equipment, accommodations, water in abundance and provision for a proper regimen, all of which are vitally necessary if the most successful results are to be accomplished.

The preliminary plans prepared by the State Architect in cooperation with the Conservation Commission, after a careful study of the systems in Europe, and actual visits to a number of the more important mineral water resorts of this country, naturally divide themselves into two principal parts. Of first importance, they provide for suitable buildings which will permit the giving of every hydro-therapeutic treatment which the wonderful water resources of Saratoga make possible. In connection with the treatments, proper hotel accommodations are also provided for, without which it will be impossible to properly administer the treatments. The plans provide in the second place for converting the land surrounding the proposed site of the buildings into a large park, especially designed for the recreation of the patients and for the graduated exercises which are an essential part of many of the treatments. The proposed location of the bath house and hotel is in Geyser Park, on the plateau overlooking the Vale of Springs and Coesa Creek, at an elevation of about sixty feet above the stream.

The chief treatments to be given in the bath house will be the Saratoga system of mineral water baths for disorders of the heart and circulatory system, and mineral water baths for the treatment



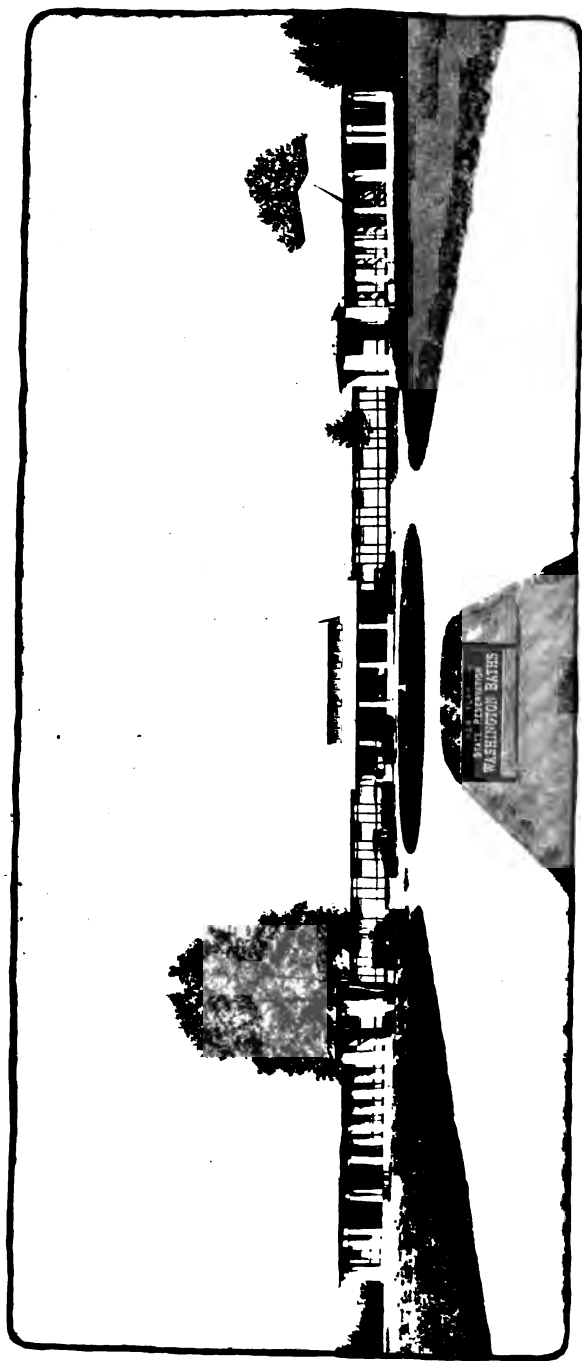
PROPOSED DEVELOPMENT OF THE STATE RESERVATION.

of high and low blood pressure, rheumatism, neuritis, and kindred disorders. These are the treatments for which Nature has most richly endowed Saratoga, and which may not be taken elsewhere. They all require rest after the baths, and several years' experience has amply demonstrated that far better results are obtained when individual rest rooms are provided. This is particularly true in cardiac and nervous cases. The plans for the bath house accordingly provide for two individual rest rooms adjoining each bath room. This will permit absolute privacy and quiet, and will at the same time permit the most rapid handling of patients, consistent with adequate periods of rest.

It is expected, however, that the greatest advantage will be derived by serious cases from the fact that the hotel will be operated in close connection with the bath house, making it possible for a patient to leave his hotel room, either walking or in a wheel chair, descend by elevators to the bath house, receive the prescribed treatment, and return to the complete privacy of his own room for the rest period. Many cases that could now be greatly benefited by the Saratoga baths are unable to take them because the hotel accommodations in Saratoga and their relation to the bath houses have not been properly designed for treatments of this sort.

In addition to the treatments mentioned above, the bath house will administer a long list of electric and heat treatments, massage, douches, and irrigations, and will in addition provide all of the gymnastic equipment necessary for special courses of exercise in connection with certain of the treatments.

In addition to the bath house, an adequate drink hall is planned. Many of the diseases for which the Saratoga waters are specially adaptable are treated by internal administration of the waters, without the baths, while others require a combination of baths with internal administration, diet and exercise. Proper relation of the drink hall to the bath house in the whole general plan is thus of the greatest importance, and is having careful consideration. In this connection, many of the ablest authorities believe that the best results in drinking the waters are obtained when the waters are taken at the springs at their natural ground temperature. So far as possible this will be facilitated. Inasmuch as moderate exercise is an important part of many of the cures, the



WASHINGTON BATHS, FULLY COMPLETED AND OPENED FOR OPERATION IN 1920.

walks about the Reservation to the sources of the various springs will add to the effect of the treatment, when the waters are taken at the fountain head.

Access to the site of the bath house and hotel from the city of Saratoga Springs and from the Lincoln and Washington bath houses will be by the Avenue of Pines, which it is proposed to make into a beautiful parkway. From the south, entrance to the hotel and bath house will be by means of a subway under the railroad tracks near Hathorn No. 3 spring and thence along the western part of Geyser Park and over Coesa Gorge by a stone viaduct.

The plans for the parking of the property provide for extending and widening the present roads in Geyser Park into beautiful drives. The approach to the ravine will be graded to make the ravine easily accessible. Paths will be laid out according to the system so well developed in Europe for graduated exercises in hill climbing, and the use of these paths will form a part of the regime in connection with the courses in cardiac therapy.

As has been reported before, about 355 acres of land lying south of Lincoln Park and west of Geyser Park, and forming a unit with those two properties, have been acquired by private purchase, and at non-speculative prices, and are now being held for acquisition by the State at their actual cost price, if the Legislature should decide to proceed with this development. If this land is added to the Geyser and Lincoln Parks, there will then be included in one block about 800 acres of land, which, with the exception of two small parcels, will comprise all of the land lying between South Broadway and Ballston avenue for about three miles south of the city.

Southwest of Geyser Park is a tract of 108 acres, on which is now located the new nursery of the Division of Lands and Forests. The old nursery between the Geyser bottling works and Coesa Spring will be treated as a park, and connected with the Geyser Park by an underground subway, so that it will be possible to walk from the hotel and bath house over the proposed stone viaduct across Coesa Creek, through the subway to the site of the old nur-

sery, and thence to Coesa Spring, Hathorn No. 3 Spring, and Hathorn No. 2 Spring, and from there to the new State nursery. The return can then be made through the Geyser ravine, up through the Ferndell ravine, and across the plateau to the hotel and bath house, a distance of several miles, all in a beautiful wooded park, at various points in which the life giving waters of the Reservation may be obtained at their sources.

Throughout all of this large and beautiful park will be erected shelters and along the various graded paths will be placed comfortable benches, enabling patients to rest at intervals during their exercises.

In treatments of the sort given at Saratoga, mental relaxation is often quite as important as the treatment. This has not been overlooked in preparing the plans, which provide for an eighteen hole golf course on the plateau south of the hotel and bath house, and for tennis courts and other means of outdoor recreation. A new concrete dam erected this year on Coesa Creek impounds a sufficient quantity of water for skating in winter. It is proposed to build another and larger dam further down in the Geyser ravine, where an old dam is now located, and this will make a beautiful lake in the gorge of Coesa Creek, which can be used for both summer and winter sports. Provision has also been made for toboggan slides, snow shoeing, and all other winter activities, for the purpose of attracting patients to the Reservation throughout the winter months, when treatments can be taken quite as effectively as in the summer.

The carrying out of plans for the consistent development of the State Reservation as a cure center will involve the expenditure of State funds, but in a matter of public health, and, moreover, one which has been so abundantly demonstrated to be worth while, the State should not longer delay.

FINANCIAL CONDITION

The income producing departments show for the fiscal year ending June 30, 1920, the small net profit of \$223.61. This is due to the fact that the water bottling business and drink hall were taken over by the Saratoga State Waters Corporation on



WARMING THE BATH WATER BY RADIATION IN THE TUB PERMITS A HIGHER DEGREE OF SUPERSATURATION WITH CO₂, THAN AT ANY OTHER SPA IN THE WORLD.



PRIVATE REST ROOMS OF THE WASHINGTON BATHS ARE ESPECIALLY DESIRABLE FOR
CARDIAC AND NERVOUS CASES.

March 1, 1920. This change deprived the Conservation Commission of the revenue from the water business during the spring and early summer months, after these plants had been operated by the State through the winter months, when a considerable loss is always sustained, because of heavy fuel bills and the impossibility of making shipment of bottled water during the cold weather. Judging from the same months in previous years, had the State operated the bottling business during March, April, May and June, the gross revenue would have been in the neighborhood of \$20,000 more.

When the State was carrying on the bottling business it was possible to so divide the employees' time that a portion of the expenses was borne by the various plants. Under present conditions, it is necessary to retain nearly as many employees to take care of emergencies which, under the terms of the lease, must be taken care of by the State on short notice. This means that all these expenses must be borne by those branches of the work which are still controlled and operated by the Conservation Commission. For instance, as the plants were formerly operated, it was possible to send mechanics from a bottling plant to a bath house to take care of emergency work, or vice versa, whereas now it is necessary to carry the same force of mechanics in the bath houses alone.

Another condition which has tended to reduce profits has been the constantly increasing cost of operation through higher wages and the greater cost of supplies and material. It has been the policy of the State not to raise its prices on bottled water except when absolutely necessary. The following table shows how some of the more important of these items have increased in price:

	1918-19	1919-20	Percentage of increase
Wages	\$2 75	\$3 50	27
Coal	9 10	12 00	33
Boxes and packing material..	55	65	18
Sheets, per dozen, and other linen in proportion.....	13 50	30 00	122
Towels, per dozen	8 25	10 00	21
Tools of all kinds, pipe and fittings . . . . .	.....	.....	75-100



QUIETNESS AND SECLUSION ARE ESSENTIAL IN THE REST PERIOD FOLLOWING CARBONATED BATHS.

The receipts of the fiscal year 1918-1919 included a large payment of accrued rent on the Crocker and Scully properties, now occupied by the Hudson Valley Railway Station. As the corresponding payment during the fiscal year 1920 covered only one year's rental, the receipts from this source are, of course, not as large.

The following table shows cash receipts from 1914 through the first half of the fiscal year 1920-21. Even with the enormous increase in the bathing business during the summer of 1920, the receipts for the first six months of the fiscal year 1920-21 show a considerable decrease from the corresponding period of last year, due to the loss of revenue from the bottling business.

Remittances to Comptroller from 1914 to 1920

Fiscal year		Amount
1914.	By State Reservation	\$1,085 33
1915.	By State Reservation	14,891 22
1916.	By Conservation Commission	59,518 05
1917.	By Conservation Commission	63,495 67
1918.	By Conservation Commission	81,773 50
1919.	By Conservation Commission	103,542 30
1920.	By Conservation Commission (July 1st to Dec. 31st, 6 mos. only)	68,555 92

BATH HOUSES

During the season of 1920, the newly completed Washington bath house was thrown open to the public. During the winter and spring, the surfacing of the floors and interior plastering and painting on this building were completed, but, owing to the inability of the contractor to get proper materials, the laying of the terazzo floor in the lobby prevented the opening of this building until July 18th.

The enormous increase in patronage of the baths during the season of 1920 caused overcrowding at the Lincoln and Saratoga bath houses at certain periods of the day, this being particularly noticeable between 10 a. m. and noon, when it was found necessary to turn away patrons because of lack of sufficient facilities

to give them proper treatment. This overcrowding was not felt at the Washington bath house, because of the appointment system in operation there. Under this system the patients were assigned a certain hour of the day for treatment, and the assignments for each hour were controlled by the number of people who could be treated comfortably and conveniently during that hour, aiming always toward perfect service and efficiency, and the entire satisfaction of the patient.

The following table proves conclusively the enormous increase in the number of patients treated during the several years that the State bath houses have been in operation, showing, as it does, an increase in 1919 of 58 per cent over 1918, and an increase in 1920 of 44 per cent over 1919. The total number of treatments given in 1920 was 52,866.

**Treatments Given in State Bath Houses from 1914 to 1920,
Inclusive**

Calendar year		Number of treatments
1914.	Bath houses operated by former State Reservation Commissioners	7,843
1915.	Bath houses operated by former State Reservation Commissioners	11,292
1916.	Bath houses operated by Conservation Commission	17,081
1917.	Bath houses operated by Conservation Commission	21,959
1918.	Bath houses operated by Conservation Commission	23,305
1919.	Bath houses operated by Conservation Commission	36,808
1920.	Bath houses operated by Conservation Commission	52,866

The gross receipts from the bathing business in the calendar year 1920 show an increase of 54 per cent over the whole of 1919, which was the best preceding year, while the bath house receipts for the first six months of the present fiscal year are

\$50,976.39, exceeding the total bath receipts of the previous fiscal year by \$8,597.25. It will be noticed that the percentage of increase in receipts is greater than the percentage of increase in the number of treatments given. This is accounted for by the fact that the prices for treatments at the Washington bath house were placed at from one-third to one-half higher than in the Saratoga and Lincoln bath houses. It was felt that this increase in price at the Washington bath house was more than justified by the more modern and improved facilities for treatments, pleasanter surroundings as to dressing rooms, rest rooms and general spaciousness of the building, and more painstaking attention and care from the bath attendants, due partly to the better facilities and partly to the fact that a larger staff of carefully trained attendants was carried at this bath house.

To take care of the enormous influx of patrons at the Washington and Lincoln bath houses, it was found necessary to replace one of the two small Ford busses, carrying seven passengers each, with a larger bus, having a capacity of eighteen passengers.

At the Saratoga bath house, the number of dressing rooms was considerably increased before the opening of the season. The cabinet and other hydrotherapeutic apparatus were brought closer together and the space allotted to rest rooms was increased, all with a view to taking care of the expected increase in patronage. Had these changes not been made at the Saratoga bath house, and had the Washington bath house not been ready to open, it would have been necessary to turn away all of the increase of business during the past season, as the Lincoln and Saratoga bath houses in their former state could not have handled the treatments in a satisfactory manner.

Additional bathing facilities are now being added on the second floor of the Lincoln bath house, to help take care of the anticipated increase for the season of 1921. Twenty-eight tubs, with the requisite amount of dressing room and rest room space, are being installed. This will provide sufficient additional capacity for the season of 1921, but it will readily be seen that in a business which has grown from approximately eight thousand treatments in 1914 to approximately fifty-three thousand treatments in 1920, the means for giving these treatments, as at present



THE SOLARIA AND PORCHES PERMIT THE EASY RELAXATION WHICH IS NECESSARY IN MANY HYDROTHERAPEUTIC TREATMENTS

provided, will be entirely inadequate to take care of a large future growth. Additional facilities must be provided at the earliest possible date or the people of the State of New York will not be able to take full advantage of their investment at Saratoga Springs.

BOTTLING PLANT

In January, 1920, the Court of Appeals handed down its final decision giving to the Saratoga State Waters Corporation the right to bottle and sell the mineral and fresh waters on the State Reservation at Saratoga Springs, under the lease granted to the above named corporation by the former Commissioners of the State Reservation in the early part of 1916, just before the control of the State property at Saratoga Springs passed into the hands of the Conservation Commission. This lease was for a term of five years from May 1, 1916, with the privilege of four 5-year renewals, making the total life of the lease twenty-five years.

Under the terms of the lease, the Conservation Commission turned over to this corporation the Hathorn No. 2, Coesa, Geyser, Orenda and Ferndell springs, the Geyser bottling plant, the Ferndell bottling plant, the warehouse and switch at the Geysers, the Hathorn drink hall and water department offices, and land surrounding these springs and buildings.

The Conservation Commission is required to make all major repairs and replacements to buildings, machinery and equipment, to maintain the tubing, seals and pumps for the various springs and pipe lines from the springs to the bottling plants, and to maintain a chemical and bacteriological control and make analyses of the waters, as delivered to the bottling plants and bottled by the corporation. The corporation pays to the State a royalty on waters sold.

This corporation elected to take charge of the bottling business on March first of the past year, and has carried on the business since that time, having complete charge of the bottling and sale of the waters.

Inasmuch as the State has to maintain the same chemical department, engineering department and repair crews, and has



THE LINCOLN BATH HOUSE.

to provide inspection and technical supervision of the bottling industry, under this lease, without receiving the total gross income of the bottling business, it is evident that the proportion between the operating and overhead expense and the receipts has been changed to such an extent that the financial reports during the term of this lease are bound to show a condition at Saratoga which is less advantageous to the State than were conditions before the lease went into effect.

At the request of the Saratoga State Waters Corporation, under the terms of the lease, the interior of the Geyser bottling works has been repainted, additional gauges and piping have been installed, the vertical boiler at this plant has been retubed completely, and broken concrete floors and sills have been renewed. At the Ferndell bottling plant, new grates have been installed under the horizontal tubular boiler in place there. At the Hathorn drink hall building, new grates have been installed under the horizontal tubular boiler and all the masonry of the fire box has been relaid.

The Accounting Department of the Conservation Commission has been moved from its former offices to make room for the Waters Corporation, under the terms of the lease, and is at present working in the former engineering department office, where a new fire resisting vault was built to house the records of the department.

WELLS AND SPRINGS

The year 1920 has marked a continuance of the established policy of carefully maintaining and regulating the flow of the various wells and springs owned by the State. During the year, the Karista, Clark No. 2, Hayden, New York Dam and Patterson wells were retubed and resealed completely, wrought iron, copper steel and copper pipe being used. These three metals have been found to be the most satisfactory for this work and each is put in when different conditions indicate its use.

ENGINEERING DEPARTMENT

The work of this department covers the installation of all equipment, and the operation, repair and maintenance of the machinery in every branch of the work, including bottling machinery,

pumps, steam boilers and electrical equipment. It includes also the supervision of engineering details connected with the work on the parks and roads, and the operations of the well crew. The following are some of the more important projects which have been carried out during the past year.

The design and construction of all alterations and additions to the system for supplying mineral water to the three bath houses were completed, thereby more than doubling the amount of water available for bathing purposes. Designs have also been completed for further additions to this system, to be installed during the coming winter, which will again increase this water supply by a large amount. A new 150 horse power water tube boiler is to be added to the equipment at the Heating Plants which supplies the Washington and Lincoln bath houses, together with the necessary receivers, feed pumps and other apparatus. The re-filtration system in connection with the open air swimming pools at the Lincoln Baths was increased in efficiency by the installation of a centrifugal circulation pump and larger pipe lines, making it possible to filter the entire contents of the pool each day.

Surveys and computations were completed for changing the course of the road leading from Geyser Park to Ballston avenue, near Hathorn No. 3 spring. Designs were completed for a new concrete gravity dam on Coesa creek near the Geyser bottling works. This dam was constructed by the Department's own force under a special fund estimate, and takes the place of the old timber dam which failed in the spring of 1920.

Designs have been worked out and construction started on the placing of twenty-eight additional tubs in the second floor of the Lincoln bath house with the proper dressing room and rest room facilities. This work includes the entire remodeling of the second floor of this building, and will be completed in plenty of time for the season of 1921.

In conjunction with the Chemist, control readings of water levels have been taken on a considerable number of wells to determine the relation of surrounding wells and springs to a spring from which water is being taken.

With the cooperation of the State Engineer, a complete contour map of all the State properties at Saratoga has been made.

This map is to the scale of one hundred feet to the inch and will be of great value in connection with the design of future development, as well as being of use in the preparation of guide maps, property maps and other data. From this map, models in relief of the whole of the Geyser and Lincoln Parks have been prepared.

With the cooperation of the State Department of Health, an investigation of the sanitary sewage system on the Lincoln tract has been conducted, with a view to altering the present system, or providing a new system to take care of the increased amount of sewage from the Washington and Lincoln bath houses. It was decided to replace the present tile sewer with cast iron of proper size to take care of future needs.

Designs have been completed for the installation of a new mineral water main from the Lincoln tract to the Saratoga bath house and the free service stations in Saratoga. It would be advisable, during the coming year, to install a line of at least 4-inch size of cast iron pipes with universal joints from the Lincoln tract to the Saratoga bath house. This will permit a higher pressure to be carried at all times and will obviate the necessity of replacing the present large storage tanks at the Saratoga bath house. These tanks are at present in a very poor condition, they are leaky in the seams and deeply corroded from the action of the mineral water and gas. Owing to this fact, they should either be repaired or replaced. It would undoubtedly be a cheaper proposition to install the higher pressure line from the Lincoln tract, thus enabling us to take the water under high pressure at the tubs in the Saratoga bath house and eliminating the necessity of running two large pumps all during the winter months, in order to keep the line that exists approximately full.

The material has been purchased for a new pipe line from Hathorn No. 2 spring to the Geyser bottling works, but, owing to difficult labor conditions, it has been impossible to install this line during the present season.

CHEMICAL LABORATORY

During the past year, the laboratory has continued the regular control on the various springs and wells of the Reservation, and a general improvement of some of the springs has been noted. This is true with regard to both mineral and gas content.

The mineral water levels of a number of the wells at the Lincoln and Natural Carbonic tracts have been recorded from May throughout October. These wells were selected at various places and in every direction to the outlying edges of the tracts.

From these records, very important facts have been discovered and added to other important data obtained in previous years.

Since March 1, 1920, when the Saratoga State Waters Corporation assumed control of the bottling water privileges, the laboratory, in accordance with the terms of the lease, has made frequent tests of the waters bottled by them. A partial chemical analysis and tests for carbonation have been made on each run of bottled water. The results of these tests have been reported each month to the Waters Corporation.

There have also been two complete analyses of each mineral water bottled by them, and one complete and five bacteriological examinations of the water from the Ferndell spring. About 350 individual determinations were required for this work. Recently, practically all of the tubes in the boiler at the Geyser plant gave out, because of pitting above the water line of the boiler. Inasmuch as this boiler was entirely new two years ago and no such trouble had been experienced with the old boilers in the plant, an examination of the feed water was made. It was found that the water was slightly corrosive, and a sufficient quantity of soda-ash will be used to overcome the difficulty.

The chemist has also devoted considerable time to the inspection of the various operations both in the mineral water bottling plant and in the Ferndell plant, and has offered at different times criticisms and suggestions as to the method of operation. Owing to the fact that the State no longer controls the bottling of the waters, experimental work in connection with bottling has been discontinued, and no research work has been done.

Further observations, in an endeavor to find a suitable metal for conveying the water in the larger size pipe lines required for bathing purposes, have been made. Aluminum pipe was tested, but it does not withstand the action of the salines and gas and, furthermore, is rather expensive in large sizes. It would appear that cast iron pipe with universal joints is the most satisfactory

material in all respects. It withstands the action of the salines much better than wrought iron and, due to extraordinary thickness of the metal, it will probably be serviceable for at least seven or eight years.

Complete analyses made during the year 1920 are as follows:

Two for Geyser.

Two for Hathorn No. 2.

One for Congress No. 2, formerly Orenda.

Two for Coesa.

One for Congress.

One for Hathorn No. 1.

Complete analyses of the boiler water at the Geyser plant.

Five hundred partial analyses, including chlorine, alkalinity and carbonation tests.

Two sanitary analyses of the water from the fresh water wells supplying the swimming pools at the Lincoln Bath.

One complete sanitary analysis of the water from Ferndell spring.

Five bacteriological analyses of the water from Ferndell spring.

PARKS AND ROADS

One of the largest tasks attempted during the past year was the laying out of roads and the filling, grading and seeding of the lawns extending from in front of the Washington bath house to the grounds of the Lincoln Baths. This work was completed early in the summer. The work of filling and grading in the rear of the Washington Baths and in front of the Heating Plant must be completed before the season of 1921, and the necessary shrubbery and trees must be set out on the whole Washington tract early in the spring, in order to properly complete the work in this area.

The lawns about the new pavilions at the corner of Spring and Putnam Streets and near the Peerless springs were graded and seeded during the past year and the shrubbery rearranged. Walks and paths were laid out and concrete and wood benches of an attractive design were placed for the convenience of the public.

A six foot concrete sidewalk was laid on the Putnam Street, Spring Street and Henry Street sides of the first-named pavilion.

At the former site of the State Nursery on Ballston Avenue, between the Coesa and Geyser springs, no work was attempted during the past season, for the reason that the Division of Lands and Forests was not able to complete the moving of its nursery to the new location at the extreme southern end of the Reservation. When this moving is finished, the vacated tract will be brought into the general scheme of park development along this main highway, as outlined in the report for the year 1919.

During the year, a considerable amount of filling and widening has been completed on the roads in Geyser Park and, although much of this work still remains to be done, the roads are at present entirely accessible to automobile traffic at all times. It is hoped to finish the widening and straightening of these roads during the coming year, and also to complete a new road around the sharp hill just west of Karista spring, in order to make this route a safe and convenient entry way into the park from the state road leading from Schenectady to Saratoga.

On the Avenue of Pines, extending from near the Washington bath house to Geyser Park, the two inner rows of trees were transplanted, changing the three narrow roads into one wide thoroughfare. In addition to this, a cinder sub-base was laid throughout the entire length of the Avenue, and a gravel wearing surface will be placed on this sub-base. This road has proved to be a very popular short cut between Saratoga and the Geyser district, and is in constant use by our own trucks and vehicles, as well as by a large amount of general traffic.

When this work is completed, during the coming season, a complete guide map of the State Reservation will be published for distribution to visitors, in order that automobile parties may view the attractive scenery and the spouting springs in Geyser Park with more comfort and convenience than has hitherto been possible.

The failure of the old wooden dam on Coesa creek, near the Geyser bottling works, in March of last year, made necessary the replacement of the dam. During the past Autumn, a permanent

concrete dam of attractive design was erected at this point. This will maintain the Geyser Lake at the same elevation as the old wooden dam and also will increase, in a large measure, the attractiveness of that part of Geyser Park near the bottling plant. Provision was made in the erection of this dam for the ultimate use of this water power, should it at any time be found desirable.

CONSERVATION BUREAU
OF
ATTORNEY-GENERAL'S OFFICE

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CONSERVATION BUREAU
OF
ATTORNEY-GENERAL'S OFFICE

Charles D. Newton.....	Attorney-General
Adelbert F. Jenks.....	Deputy Attorney-General
	In Charge of Conservation Bureau
E. J. Lake.....	Deputy Attorney-General
Eugene E. Howe.....	Deputy Attorney-General
P. J. Finn.....	Deputy Attorney-General
W. T. Moore.....	Deputy Attorney-General
J. O. Bates.....	Deputy Attorney-General

REPORT OF CONSERVATION BUREAU

ATTORNEY-GENERAL'S OFFICE

As indicating the character of the work in this Bureau a few special cases are here mentioned. They are but a small part of its accomplishment, however.

Many opinions have been rendered involving matters pertaining to the forest preserve, fish and game provisions of the statute, the Saratoga Reservation, rights of Indians on various subjects, and other questions of importance.

Actions to determine title to lands in the Forest Preserve were commenced against occupants of such lands. Judgment was entered against the state in these actions; and, as the state had previously purchased same from George N. Ostrander and John W. Olmstead, the Conservation Commission requested that actions be instituted to recover the purchase price of the land with interest. Mr. Ostrander and Mr. Olmstead have recently paid to the state the sum of \$793.13 representing the purchase price of three parcels located in Hamilton and Greene counties. An action is pending in Warren county against the Raquette Falls Land Company to recover \$1,111.50 with interest,—the purchase price of this property. Other actions are pending against Mr. Ostrander and Mr. Olmstead for the recovery of the purchase price of lands located in Ulster county.

Seven partition actions have been instituted by Frank L. Bell and George N. Ostrander in which the State is made a party defendant. They are as follows: 1. Frank L. Bell vs. John Stabler et al, where lands in Township 8, Totten and Crossfield's Purchase, Hamilton County, are involved. 2. Frank L. Bell and Stella Phelps Bell vs. Mary L. Catlin et al. involving several lots in Township 3, Totten and Crossfield's Purchase, Hamilton County.

3. George N. Ostrander and Harriet E. Ostrander vs. Frank L. Bell et al. This action relates to Lot 19, Oxbow Tract, Hamilton County. 4. George N. Ostrander vs. Frank L. Bell et al. where lands in Township 50, Totten and Crossfield's Purchase, Hamilton County are the subject of the partition action. 5. Frank L. Bell vs. George N. Ostrander et al. This action pertains to lands in Hamilton and Essex counties; townships 2 and 3 in Hamilton County and Townships 11 and 12 in Essex County. 6. Frank L. Bell and Stella Phelps Bell vs. Benjamin Sundford et al. involves part of the south half of Township 16, Hamilton County. 7. Frank L. Bell and Stella Phelps Bell vs. John Stabler et al. The lands here involved are located in Township 8, Totten and Crossfield's Purchase, Hamilton County.

The State of New York owns an undivided one-third of the south-west one-quarter of Lot No. 218 in Township No. 11, Old Military Tract, Essex County. William N. Lamb of Lake Placid owns the other undivided two-thirds of said lot. An action in partition was commenced in January 1920 and interlocutory judgment was filed June 23, 1920 appointing James Hurley of Lake Placid, Frank Everest of Wilmington and Merritt C. Stanton of Elizabethtown as commissioners to make the partition. On July 3rd the Commissioners were notified to meet; but Mr. Stanton failed to appear at that time. On September 30th the Commissioners met at Lake Placid and the report was submitted to them for execution. An error in the description of the two portions of the lot caused a further postponement and the action is held in abeyance until the description is corrected.

Another partition action involves the Tract west of Road Patent, Essex County. An agreement between the State, represented by the Forest, Fish and Game Commission and Finch, Pruyn & Company for partition of this property was entered into in the year 1909. This agreement has never been consummated and the Conservation Commission has requested this Bureau to commence an action to finally adjust the matter.

An ejectment action was commenced in the town of Hope, Hamilton County, against George Baldwin and Jennie Baldwin

in 1918. The plaintiffs sought to recover certain lands in the possession of defendants. The People claimed under a Comptroller's tax deed. The defendants claimed title by adverse possession. The land was occupied for a period of sixty years and the taxes were paid by those claiming same. While thus occupied, the Forest Preserve was created in 1885. The State received its deed in 1851. Occupancy commenced about 1857 or 1858. The first deed by an occupant was given in 1865. The case was heard by Justice Whitmyer and in his opinion it was held that title by adverse possession "could not be acquired as against the State." Judgment for plaintiffs.

Judgment was recovered in 1904 in an ejectment action commenced against George Carlin, an occupant of a camp site on Raquette Lake. The State issued an execution within five years from the entry of the judgment; but this was withdrawn, and the defendant gave to the State a bond, to the effect that unless he removed from the premises within a certain period he and his surety would pay to the State the sum of \$2,000. This sum was never received by the State and the defendant was allowed to remain in possession of the property. In 1918 this Bureau deemed it advisable to ask leave to issue execution. Motion for such leave was heard and granted at Special Term. Upon defendant's appeal to the Appellate Division, the order of the Special Term was reversed. Justice Kellogg in his opinion held that by plaintiff's inaction for so many years, a doubt has been thrown upon the judgment, and the question should not be disposed of on motion, as the defendant now asserts a right in the property acquired since the judgment, and should have a trial. The execution was denied so that action may be brought against Mr. Carlin, using the old judgment, so far as may be, as proof of title; but leaving the facts arising since its recovery for the consideration of the court and jury.

James E. Watters has paid to the State the sum of \$388.98 on a judgment secured against him for trespass on lands in the Forest Preserve located in Lewis County.

Many actions have been commenced against hunters for taking deer with artificial light, etc. Among settlements perfected for

these violations are the following: People v. Bernice Wilkins et al., \$150; People v. Arthur Adams et al., \$75; People v. Orson Vasser et al., \$60.

An action against John A. Addis and others was adjusted by the defendants by the payment of \$400 for a violation of the Conservation Law in possessing 70 brook trout less than six inches in length.

Mr. O. W. Pierce of Olean has paid to the Commission the sum of \$100 for the illegal possession of trout and the operation of a trout hatchery without a license.

Various pollution matters have been given attention by this Bureau during the past year and the conditions whereby refuse has been deposited in streams inhabited by fish have been remedied.

An action commenced against George W. Black and Fannie Black in 1918 has been disposed of by the redemption of the land in the payment of \$650.70 to the State. In 1812 Lot 66, Luzerne Tract, Warren County, was purchased from the State by Joseph Wicks, for the sum of \$127. The sum of \$16 was paid on account thereof and Mr. Wicks gave his bond to the State for the remainder due on such purchase. Payments of principal and interest were made until 1818 at which time there remained unpaid upon the said bond the sum of \$91.39. George W. Black subsequently acquired all the interest of said Joseph Wicks; and judgment has been rendered that he is the equitable owner of said lot 66 and permission was granted to pay the amount now actually due upon said bond, which Mr. Black has done.

Several claims involving the appropriation of lands have been referred to this Bureau. One claim filed by the Robert W. Higbie Company against the State refers to lands in Macomb's Purchase, St. Lawrence County, and the alleged damages amount to \$300,000. The claim of the Herkimer Lumber Company is on the calendar of the Appellate Division for the January term. This is an appeal by the State from a judgment of the Court of Claims entered January 15, 1919. The claim of the Taggarts Paper Company is on the calendar of the Court of Appeals. The

result of the proceedings in the Court of Claims was the judgment of \$203,384.95 entered July 9, 1918, and the supplemental judgment for \$9,558 entered November 19, 1918. Judgment of affirmance was entered upon an order of the Appellate Division, Third Department, May 20, 1919.

Appeal by the defendants from a judgment of the Supreme Court in an action in ejectment against Jennie H. Ladew and Joseph H. Ladew is now pending. The People, by this judgment, recover the possession of Osprey Island in Raquette Lake.

FINANCIAL STATEMENT

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FINANCIAL STATEMENT

SUMMARY OF RECEIPTS AND DISBURSEMENTS, EX- CLUSIVE OF REGULAR ACCOUNTS WITH THE STATE COMPTROLLER AND OF DIVISION OF SARATOGA SPRINGS, FOR FISCAL YEAR ENDING JUNE 30, 1920.

RECEIPTS

Fines and penalties	\$70,332 47
Net license	28,088 69
Breeder's license	1,187 00
Hunting license	286,648 09
Magazine subscription	1,194 50
Dog license	1,980 00
Tax and rentals shellfish lands	25,133 00
Foreign game tags	3,786 20
Tagging trout	1,944 00
Importation and possession license.....	1,439 00
Cuba reservoir rentals	3,541 00
Trespass on State lands.....	4,343 84
Sale of trees	6,566 76
Fire rebate	3,885 61
Top lopping	550 00
Refund on payroll	39 34
Fire fine	189 09
Miscellaneous receipts	581 73
Sale of skins	948 75
Sale of fish	2,240 00
Sale of hay	423 00
Sale of old building	1,117 00
Sale of old auto	160 00
Refund from Indian River Co., land purchased by the State	10,550 26
	<hr/>
	\$456,869 33

DISBURSEMENTS

By checks to State Treasurer	454,700 89
By cost of collection	2,168 44
	<hr/>
	\$456,869 33

Disbursements

(Exclusive of Division of Saratoga Springs)

Administration

Salaries, regular	\$55,015 80
Salaries, temporary	2,403 57
Fuel, light heat and power.....	113 73
Advertising	84 22
Printing—general	6,770 20
Printing, Departmental Reports and Maps....	5,031 90
Equipment and supplies.....	12,056 21
Traveling expenses	5,714 20
Communication	8,661 99
Fixed charges	71 20
General plant service.....	1,630 17
Rent	498 12
Repairs	858 36
Geo. D. Pratt—judgment and costs.....	875 41
Retired veteran, pension	194 26

\$99,979 34**Division of Fish and Game***Game protection*

Salaries, regular	\$208,929 87
Wages, regular and temporary	6,669 08
Printing	18,393 99
Protectors' expenses—equipment and supplies, traveling, etc.	89,844 38
General expenses—equipment and supplies (including hunters' license buttons, tags and tagging machines) traveling, etc.	17,260 41
Expenses of prosecutions.....	3,490 14
Rent	4,049 45
Expenses of boats and launches, including new boats	18,306 25

\$366,943 57*Fish culture*

Salaries, regular	\$24,500 00
Wages, temporary	58,708 22
Maintenance and operation of hatcheries	66,766 57
Additional land for hatchery..	600 00
Repairs to Chautauqua hatchery	18 00
Dunkirk hatchery, completion of construction	6,480 48
Dunkirk hatchery, completion of grading	960 70
Saranac Inn hatchery, completion of installation of lighting system	799 01
Field station	998 84

159,831 82

Marine Bureau

Salaries, regular	\$10,200 00
Rent	3,765 04
Maintenance and operation....	4,598 29

\$18,563 33

Game bird farms

Salaries, regular	\$12,872 50
Wages, temporary	2,965 31
Maintenance and operation....	19,716 82

35,554 63

Pollution of waters — investigations.....	5,554 39
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\$586,447 74

Division of Lands and Forests

Salaries, regular	\$32,399 24
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Reforestation

Wages, temporary, reforestation and survey	41,107 92
Expenses — general printing, equipment, supplies, hired horses, etc.	23,794 24

\$97,301 40

Fire fighting and prevention

Salaries, regular	\$96,487 27
Wages, temporary	11,423 74
Expenses—equipment, supplies, traveling, etc.	30,007 76
Erection of observation towers	6,216 32

144,135 09

Printing Departmental Reports and Maps....

5,693 50

Repairs to docks and pavilions, St. Lawrence
reservation

4,811 80

Repairs to highways, St. Lawrence reservation

295 02

Preserving shores of Lake George Islands....

5,313 80

Comstock Prison refund.....

4,410 12

White Pine Blister Rust, services and ex-
penses and payment of indemnities.....

43,905 93

\$305,866 66

State Forest Preserve Fund

Purchase of land.....	\$656,158 39
Services and expenses.....	43,150 38
Disbursements from this fund by Attorney-General's office for services and expenses....	50,808 78

750,117 54

1,055,984 20

Division of Waters

Salaries, regular	\$28,916 89
Wages, temporary	4,443 75
Expenses—equipment, supplies, traveling, etc.	9,470 12
River regulation by storage res- ervoir, services and expenses	884 83
Drainage Improvement	4,990 43
Oswego Abstract Co.—search of water power rights.....	950 00

\$49,656 02

Bureau of Docks and Dams

Salaries, regular	\$3,500 00	
Wages, temporary	924 00	
Expenses—equipment, supplies, traveling, etc.	2,026 17	\$6,450 17

Hydrographic investigations

Salaries, temporary	\$7,118 15	
Expenses—supplies, traveling, etc.	3,125 66	10,243 81

Canaseraga Creek improvement

Maintenance and improvement	\$11,305 19	
Expenses of litigation.....	3,597 75	
Payment of bonds and certifi- cates of indebtedness.....	15,000 00	
Interest on bonds and certifi- cates	13,110 85	43,013 79

\$109,363 79

Total expenditures, exclusive of Division of Saratoga
Springs

*\$1,851,775 07**Canaseraga Creek Improvement Fund**

Balance, National Commercial Bank, Albany,
N. Y., July 1, 1912.....

\$84 43

Receipts

1919

August 1, rebate on insurance premium	\$34 20	
September 30, interest on de- posits	78	
September 30, refund on interest paid upon Certificate No. 14..	1 07	
December 31, interest on de- posits	76	
March 30, interest on deposits..	72	
June 30, interest on deposits....	79	

38 32

\$122 75

Expenditures

1919

November 14, interest on Certifi-
cate No. 14, to July 1, 1919.

\$7 48

1920

January 13, interest on Certifi-
cate No. 14, to January 1....

29 60

June 17, Livingston County
Clerk, recording deed.....

3 00

40 08

June 30, 1920, cash balance, National Commercial Bank....

\$82 67

*Of this total, \$793,131.33 was expended from State Forest Preserve Fund and for Canaseraga Creek improvement as shown under Divisions of Lands and Forests and Waters.

**DIVISION OF SARATOGA SPRINGS
INCOME-PRODUCING DEPARTMENTS**

Cost of Operation

Ferndell Bottling Works

Fuel, light, power and water.....	\$597 53	
Supplies and returns	12, 021 67	
Repairs	55 39	
Wages	1, 447 06	
	<hr/>	\$14, 121 65

Geyser Bottling Works

Fuel, light, power and water.....	\$1, 250 92	
Supplies and returns.....	21, 126 24	
Repairs	476 61	
Wages	4, 487 42	
	<hr/>	27, 341 19

Packing and Shipping Department

Supplies	\$3, 899 38	
Wages	759 26	
	<hr/>	4, 658 64

Hathorn Drink Hall

Supplies	\$1, 307 30	
Repairs	446 77	
Wages	3, 200 33	
	<hr/>	4, 954 40

Washington Baths

Fuel, light, etc.	\$1 17	
Supplies	126 88	
Repairs	7 55	
Wages	270 50	
	<hr/>	406 10

Lincoln Baths

Fuel, light, etc.	\$1, 086 56	
Supplies	456 45	
Repairs	458 93	
Wages	5, 166 17	
Bus operation	1, 293 33	
	<hr/>	8, 461 44

Saratoga Baths

Fuel, light, etc.	\$5, 447 15	
Supplies	875 56	
Repairs	1, 121 73	
Wages	10, 017 47	
	<hr/>	\$17,461 91

Laundry

Linen, all bath houses.	\$2, 610 94	
Supplies	529 23	
Repairs	24 28	
Wages	1, 830 10	
	<hr/>	4, 994 55

Heating Plant and Pumping System

Fuel, light, etc.	\$1, 356 78	
Supplies	98 08	
Repairs	756 45	
Wages	122 50	
	<hr/>	2, 333 81

Cup Service

Maintenance	\$107 48	
Supplies	1, 310 87	
Repairs	40 80	
Wages	866 81	
	<hr/>	2, 325 96

<i>Putlerson Building Expenses</i>	\$209 10	209 10
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<i>Repair Crew Supplies</i>	2, 430 12	2, 430 12
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Paint Shop

Supplies	\$643 58	
Repairs	75	
Wages	136 40	
	<hr/>	780 73

Trucking

Supplies	\$935 20	
Repairs	1, 034 89	
Wages	1, 918 81	
	<hr/>	3, 888 90

Office and General Expense

Insurance on automobile	\$27 00	
Fuel, light, etc.	791 45	
Supplies	152 13	
Travel and communication	24 41	
Salaries	3,308 09	
Freight and express on sales	1,779 47	
Discounts	106 40	
Decrease in inventory of bottled water	3,178 65	
	<hr/>	\$9,367 60

Total costs of operation for all
income-producing departments \$103,736 10

Income Accounts

Ferndell sales	\$13,826 89	
Sales of coolers	295 55	
Mineral water sales	26,088 51	
Drink hall admittances and sales	10,692 90	
Washington bath receipts	112 50	
Lincoln bath receipts	20,221 67	
Saratoga bath receipts	22,044 97	
Cup sales	2,362 71	
Gas plant rents	1,059 69	
Interest	446 50	
Rentals	2,883 45	
Sales of scrap metal, junk, etc.	2,760 38	
Royalties from lease	1,163 99	
	<hr/>	103,959 71

Profit, all income-producing departments \$223 61

DEPARTMENTS NOT PRODUCTIVE OF INCOME

Operating Expenses

Personal Service

Parks and roads	\$10,741 46	
Well department	3,595 17	
Engineering department	3,052 31	
Laboratory	2,778 91	
Superintendent's office	11,559 90	
	<hr/>	\$31,727 75

Other Expenses

Parks and roads	\$4,360 31	
Well department	921 48	
Fuel, light, etc.	1,746 32	
Supplies	1,415 85	
Repairs	535 21	
Publicity and advertising.....	11,316 04	
Travel	419 63	
Communication	1,166 16	
Upkeep of car	676 94	
	<hr/>	22,557 94
		<hr/>
		\$54,285 69
		<hr/>

Extraordinary Repairs and Unusual Expenses and Replacements

Water department	\$4,427 90	
Bath department	1,489 64	
General administration	2,998 48	
	<hr/>	\$8,916 02
Experimental work	1,181 57	
Albany office salaries	2,144 02	
Depreciation	1,634 91	

Permanent Equipment and Construction

Equipment purchased	\$15,732 75	
New structures and permanent addi- tions	88,607 61	
	<hr/>	\$104,340 36
		<hr/>
		<hr/>
		\$172,502 57
		<hr/>
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Respectfully submitted,

GEORGE D. PRATT,

Commissioner.

January 15, 1921.

**PROGRAM OF FOREST AND WILD
LIFE CONSERVATION**

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PROGRAM OF FOREST AND WILD LIFE CONSERVATION

To the Legislature:

The Legislature at its last session adopted a concurrent resolution, instructing the four State agencies chiefly concerned in the conservation of forests and wild life to formulate a program of conservation which should assign to each of them its sphere of activity. The text of the resolution follows:

“Resolved, That the Conservation Commissioner, the Dean of the New York State College of Agriculture at Cornell University, the Dean of the New York State College of Forestry at Syracuse University, and the Director of the New York State Museum be and they hereby are directed to prepare an administrative and educational program for forest and wild life conservation, under which the respective spheres of activity of each institution shall be defined and delimited, and the basis of cooperation between them formulated; and to transmit this program to the Legislature at its next session as a part of the Annual Report of the Conservation Commission.”

The committee named in the resolution has approached its task of formulating a program of forest and wild life conservation in a constructive spirit, and with the realization that only by the most wholehearted cooperation in many fields can such a program be put into effect. The committee believes that in the recommendations that it has to make will be found a solution of the problems assigned to it, which will result in the promotion of the welfare of the State. It now presents its report with the suggestion that its recommendations that follow be approved by the Legislature as indicating the policy which from now on should guide the four State agencies concerned in these cooperative activities.

The report of the committee is divided into two parts. Part I contains the conclusions and recommendations of the committee. These are based on the discussions of the committee, chiefly at a meeting held in Albany in the office of the Conservation Commission on December 15, 1920, and upon statements submitted by the several members of the committee.

Part II of this report contains the detailed statements which outline the purpose and the scope of the activities of these four agencies. These statements amplify the conclusions of the committee and should be read by those desiring to familiarize themselves with the work now being carried on by the official agencies of New York State that are charged with duties relating to conservation.

As a matter of record it may be noted that the following persons were present at the meeting of the committee held on December 15, 1920:

All the members of the committee, viz.:

Hon. George D. Pratt, Conservation Commissioner

Dean Albert R. Mann, N. Y. State College of Agriculture at Cornell University

Dean F. F. Moon, N. Y. State College of Forestry at Syracuse University

Dr. John M. Clarke, Director of N. Y. State Museum

And also by invitation:

Mr. Warwick S. Carpenter, Secretary, N. Y. State Conservation Commission

Prof. Ralph S. Homer, Head of the Dept. of Forestry, N. Y. State College of Agriculture, Cornell University

Dr. H. D. House, State Botanist, N. Y. State Museum

Mr. Marshall McLean, Counsel, N. Y. State Conservation Commission

Hon. Louis Marshall, President of the Board of Trustees of the N. Y. State College of Forestry at Syracuse University, was invited to attend, but at the last moment was prevented from so doing.

PART I

CONCLUSIONS AND RECOMMENDATIONS OF THE COMMITTEE

The committee recognizes that the State Conservation Commission, the State Museum, the New York State College of Agriculture, and the New York State College of Forestry function collectively in both administrative and educational ways. The terms "administration" and "education" may be briefly defined thus:

(1) *Administration*, as covering protection and preservation, propagation and increase, and the regulation of the distribution and use of the wild life and of the forests of the State.

(2) *Education*, as combining research and teaching. Research may be subdivided into (1) administrative investigation (required for the wise and proper enforcement of law and when the results are to be used primarily for administrative purposes), and (2) research proper (study intended to increase the sum of human knowledge, or to assemble or better correlate existing knowledge, without direct reference to any particular administrative program).

On this basis the responsibilities of the several State agencies concerned should be as follows:

New York State Conservation Commission

In that the chief function of the Conservation Commission is administrative in character, it should continue (a) to have administrative charge of the Forest Preserve and of the other lands committed to it by law, and of the field of conservation law enforcement; (b) to protect wild life and natural resources, and to give to the entire State the protection from forest fire which it now gives to the area within the Forest Preserve; (c) to propagate useful forms of wild life and forest tree nursery stock; (d) to distribute the same and to assist in its proper utilization; (e) to have direction of recreation in the Forest Preserve; (f) to have administration of the field force necessary for the accomplishment of the aforesaid objects; and (g) to maintain, improve and extend the natural resources of the State.

New York State Museum

In that the chief function of the State Museum is to promote additions to knowledge and to disseminate the same, its work should consist primarily in research, followed by diffusion of information through publication, exhibition, or other means.

The State Museum should be the administrative center in the State for such scientific surveys of the natural resources of New York as are designed primarily for the acquisition of new knowledge.

New York State College of Agriculture at Cornell University

In accordance with the laws defining its work, the State College of Agriculture through its appropriate departments should conduct collegiate instruction, research, and educational extension in forestry and in game farming, fish culture, and subjects dealing with wild life in general, including aquatic life, as phases of agriculture and as functions of the biological establishment which the State has provided at Ithaca. The teaching of forestry coordinate with the teaching in other departments of instruction in the College, is recognized as a necessary and integral part of its work as a college of agriculture.

New York State College of Forestry

In accordance with its charter and subsequent laws, as a college of forestry, the New York State College of Forestry at Syracuse University should conduct teaching in forestry, both resident and non-resident, conduct the Forest Ranger School, prosecute investigation and research in forestry and wild life, and maintain the Roosevelt Wild Life Forest Experiment Station.

Recommendations Regarding Specific Conflicts

In general it is the judgment of the committee that while a measure of duplication is inevitable when work is divided, as it must be divided where different State agencies are charged with separate and distinct functions, nevertheless, as regard the four State agencies in question, the extent of such duplication is limited, and further, that this is not necessarily a disadvantage

for the reason that the problems under consideration are being approached by the several agencies from different points of view.

Biological Investigations. Like other professions based on the natural sciences, forestry is far reaching in its scope and touches upon many kindred fields. Further, in its application it uses the findings of specialists in those fields that have resulted from research and other pure science investigations. While there is much pure research in forestry under each of its five primary branches — protection, silviculture, utilization, management and policy — the essential job of the forester is on the administrative side, the proper care and handling of the forest, either to produce successive crops or to make the forest of the most service to man in some other way, such as through protection or recreation, when the latter term is used broadly. In other words, the forester is one who works largely in applied science rather than as an investigator seeking truth and facts new to science. He must therefore apply in practice the outcome of other men's research and investigation. His job is to take such findings and translate them into terms of practical application to the needs of particular forests.

There is unquestioned need that we know more about all the forms of life that go to make up the community that we term a forest. We need to study the life history and ecology of plants, birds, insects, mammals, and also the lowly forms of life in the soil or that are present in the way of fungi and the like. But just as any practitioner often needs to call in specialists, so the forester depends for his data on these technical aspects on the men in the allied fields of biology, entomology, plant pathology, botany, etc.

The majority of the committee created by the Joint Resolution of the Legislature is of the opinion that investigations in wild life are biological functions and do not come within the province of a professional college of forestry except as such an institution makes use of the results of biological investigations made elsewhere. Biological investigations and forestry investigations are regarded by the committee as distinct provinces or departments of knowledge, calling for quite distinct scientific equipment in the personnel of the investigators.

Recognizing, however, that by statute certain biological functions have been assigned to the State College of Forestry, notably in connection with the Roosevelt Wild Life Forest Experiment Station, the committee feels that it cannot go farther than to recommend the desirability of narrowly limiting the activities and expenditures of the College of Forestry in biological research. It is the conclusion of the majority of the committee that the College of Forestry should devote its energies mainly to the teaching and investigation of problems having to do with forest production, management, and utilization. If biological studies can be carried on by existing organizations that already have the men and the equipment, and are covering a field wider than the forest, it would seem to be a duplication to set up an additional establishment in a purely forestry college.

Lumber Statistics. In the discussions of the committee, certain mooted points arose in connection with the proposal of the Conservation Commission made a year ago that its forestry work be extended to the entire State by the appointment of district foresters, and the assignment to them of definite tasks. While the committee has been in general agreement with the Commission on the necessity and advisability of most of its recommendations in this connection, it has felt that the State College of Forestry at Syracuse has already undertaken the publication of data useful to lumbermen and the purchasers of forest products, and that work of this sort should properly be delegated to that institution. This is the more logical because the College of Forestry maintains a forest products laboratory, and is thus in closer touch with the users of forest products, and with the most effective and economical methods of adapting the rough timber to the final needs of the consumer. In this conclusion the Conservation Commission has agreed.

Silviculture. In the discussion of the work of the district foresters, as proposed by the Conservation Commission a year ago, some difference of opinion developed over the section of the Commission's recommendation entitled, "Scientific Cutting." Scientific cutting comes within the broad field of silviculture, and the question arose whether the stimulation of correct silvicultural

practices is properly an educational or an administrative function. There is some ground for classifying it under either head.

If the practice of silviculture is to be brought about solely or chiefly by educational work among forest owners and lumbermen, if they are simply to be encouraged to handle their lands in a wiser manner, in order that the production of successive forest crops may be assured, then the promotion of silviculture will become very largely a matter of educational extension.

As a matter of fact, it must be much more than this. The lopping of tops under the top lopping law, in order that fires may be prevented, and that debris may rot quickly, thus permitting the development of new growth, is a silvicultural practice. It has been mandatory in the fire towns for more than ten years and enforcing it is an administrative function.

In the discussions of national forest policy that have taken place during the last two years, it has been conceded almost universally that more effective silvicultural practices must be instituted. Some authorities have urged that better silviculture be mandatory under Federal supervision, while others have proposed that the Federal government offer material financial aid to those states which adopt, either under their laws or in their forest practice, silvicultural methods that will insure forest perpetuation.

Insofar as any additional silvicultural practices are made mandatory, their enforcement will be an administrative task which should be under the jurisdiction of the Conservation Commission. There is great need for much educational work in addition, which is more properly the function of the extension departments of the State College of Agriculture and the State College of Forestry. The proper coordination of the efforts of all three institutions will prevent duplication.

Continuance of the Committee

Adjustment through Cooperation. The committee has felt that the discussions brought about by the concurrent resolution have been very helpful in clarifying many unsettled questions of practical conservation in this State. Its members feel, however, that there are many lines of work which can be made to yield much more effective results if they are taken up on the basis of

continual cooperation. As is pointed out elsewhere in this report, the machinery for effective work is already in existence, but coordination has been lacking. The committee suggests that the Legislature authorize the continuance of this committee, its functions to be to act in an advisory capacity on questions affecting administrative and educational work in forest and wild life conservation and to develop cooperation and progressive action, without waste or duplication among the agencies concerned, and that it be instructed to file a report each year as a part of the Annual Report of the Conservation Commission.

The committee feels that in this way any possible duplication of effort between the several agencies will be prevented and results obtained that will entirely justify the appropriations made by the Legislature for the work of these four State organizations. Co-operative work of this sort was voluntarily undertaken by three of these agencies during the war, particularly in connection with the wood fuel campaign, and practical experience has indicated that it can be productive of the greatest good. There seems every reason to believe that such procedure will yield equally good results if applied in this larger way. No appropriation is needed for the recommended continuance of this committee.

PART II

STATEMENT OF THE FUNCTIONS AND SERVICES OF THE FOUR STATE AGENCIES CONCERNED

Following are detailed statements setting forth the objects and purposes of the four State institutions concerned with the conservation of forests and wild life in New York State, together with notes on the scope of each of these agencies and on the work now being carried on. The conclusions and recommendations that are to be found in Part I of this report are based in large measure on the accompanying memoranda. The statements from each institution are preceded by general statements dealing with the need for conservation of forests and of wild life.

Need and Methods of Forest Conservation

Within the memory of people now living the Adirondack forests were said to hold an inexhaustible supply of timber which for all times to come would be adequate to meet the lumber needs, not only of the State, but of the nation. Today New York State is cutting her forests faster than they are growing, and at the same time is importing two-thirds of the timber consumed by her enormously important wood-using industries. In fact, as was pointed out in the report of the Conservation Commission of a year ago, many of the most important industries of the State are facing the vital necessity of transferring their activities to other jurisdictions, with all of the loss which this will entail to the State's industrial supremacy.

A review of the timber situation of the entire nation reveals a condition equally serious. The vast country that was practically virgin territory a hundred years ago, a land preeminently timber producing, was able only with the greatest difficulty to meet the needs for lumber imposed upon it by the war. A survey of timber resources made by the Federal government at that time revealed the fact that we have become so impoverished of available timber, and our lumber needs are so tremendous and are so rapidly increasing, that we will be face to face with serious privations within the next generation if adequate steps are not taken imme-

diately to prevent further denudation, and to insure new merchantable growths upon all potential forest land. The end to which we are rapidly advancing is clearly indicated in the accompanying diagram of increasing population and vanishing timber supply, compiled from United States census statistics, and from

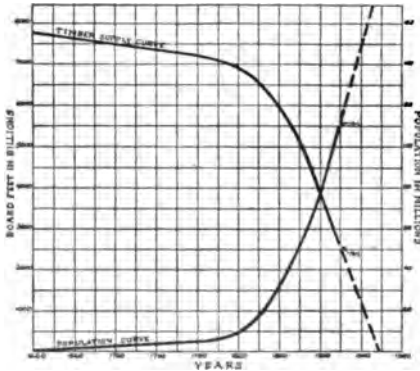


CHART SHOWING INCREASE OF POPULATION AND DECREASE OF TIMBER SUPPLY.

data submitted to Congress last year in a comprehensive report on the need for forest retrenchment.

New York State offers its own striking evidence of failure to institute adequate measures for protection and reproduction of forests. One-half of the area of the Empire State, or approximately 14,000,000 acres, is potential forest land, which will always find its highest usefulness

in growing trees. 5,800,000 acres are in the Adirondack and Catskill forest regions, which are commonly regarded as the State's chief sources of timber supply. Other scattered forest regions make up 2,100,000 acres. Farm woodlots add 4,100,000 acres, and inimproved land throughout the farming sections increases the amount by 2,800,000 acres, making a total of 9,000,000 acres of potential forest land outside of the two great mountain regions. These 9,000,000 acres are quite as important, acre for acre, as potential producers of timber, as the 5,800,000 acres of mountain land.

While some encouraging progress has been made in forest production in the mountain regions and in reforestation throughout the different parts of the State, it is nevertheless true that the great problem of the right administration of one-half of the land area of New York State has not been solved and vast areas have been entirely neglected. Meanwhile a famine of forest products is already throwing its lengthening shadow across the land.

To meet the needs of this situation will require every human resource of intellect, vision, energy, and determination. Problems of forest management yet unsolved must be investigated. This

is research, which requires special scientific training and equipment. The education of men who will devote their lives to forestry must be continued and extended. This is work equal in importance to any in our whole broad scheme of higher education. The educational work must not stop with the training of specialists, but the lessons of forest management must be taken to the people as a whole, where to a very great extent they will be given practical application. This is the vitally important field of educational extension. Finally, there remain many phases of forestry which are properly the subject of State administration, and in this field the State's administrative functions must be fully developed.

It is apparent upon even a casual study of the problem that the various agencies concerned with research, education, educational extension, and State administration are interdependent, and must function collectively, if duplication of effort is to be avoided, if there is to be no working at cross purposes, and if the best use of one-half the land area of the State is to be promoted without waste.

Need and Methods of Conservation of Wild Life

The need for more effective conservation of wild life resources is quite as apparent as in the case of the forests. Some recent studies of certain phases of wild life have revealed a financial value of which we formerly had not even an approximate measure, and have thus served to strengthen our realization of the importance of these resources in the life of the people.

The biological investigations of the Conservation Commission have just shown that in 1918 licensed hunters, who reported game killed by them on their 1919 license stubs, took game worth over \$3,200,000, which, if capitalized on a basis of six per cent annual dividend, indicates that the State's stock of wild life which is hunted and trapped is worth not less than \$53,000,000. These figures, however, are minimum, since many hunters failed to report, and no account is taken of the fur bearing animals trapped by minors or of the illegal kill, which is admittedly great. It is quite proper to take into consideration the illegal kill, for even though game is killed illegally, it has value, and reduces

by that much the total capital stock of the State. It is one of the problems of conservation to reduce this illegal kill to a minimum, in order that the total net stock may be increased and the annual dividend lawfully taken be correspondingly greater. After allowing for incomplete reports, it thus seems probable that the wild life which is shot and trapped each year is worth not less than \$6,000,000, which, if capitalized on a six per cent basis, would make the total stock in the State worth not less than \$100,000,000.

It is of the utmost importance to keep our feet solidly on the ground in all statistical discussions of this sort, and not permit our decisions to be swayed by extravagant and imaginative assertions. Facts, however, furnish an ample basis for appreciating the importance of wild life. The Conservation Commissioner of the State of Minnesota, for instance, has just analyzed the reports of hunters made direct to the commission, and they show that in that state alone in 1919 approximately 2,000,000 wild ducks were legally taken. Astounding as this figure is, it is based upon fact. It indicates the enormous value of one single factor in wild life resources.

The capitalized value of \$100,000,000, given above, is based only on game shot and trapped, and takes no account of the enormous value of song and insectivorous birds, which are absolutely indispensable for the conduct of agriculture in New York State. No sound basis has yet been worked out for estimating the value to agriculture of this wild life in dollars and cents. It may be stated without dispute, however, that its value approximates the value of agriculture itself, for without the bird control of insect pests, farming would be almost impossible.

Nor have the figures, given above, taken account of the value of fish annually caught for both sport and food in the rivers and lakes and in the seas subject to the State's jurisdiction. We have no sound statistical basis for estimating these values, but it is generally admitted that the value of fish for sport and food is greater than that of game.

Wild life is intrinsically valuable. It is valuable as an incentive to sport and recreation, which is so essential for the health and moral well being of the nation, and it is valuable also because it makes possible many essential activities, and even life itself.

Nevertheless, the means of protecting, conserving, and propagating it, and all of the manifold ways in which it touches the life of the people, are too imperfectly understood. Even such knowledge as we do possess is only partially utilized in administrative practice.

This committee is convinced that the greatest advance that can be made today in the conservation of wild life resources will be the application to this task of such scientific and exact methods of analysis and practice as have come to characterize the science of forestry. Even though we have much to learn in forestry, and still further to go in the application of its principles, it is nevertheless true that forestry is a genuine applied science. The conservation of wild life has not yet attained to this position. Less is known about it than we know about trees. Men specially trained for work in many of its phases are difficult or impossible to obtain, while forestry has come to be one of the well recognized professions, with a highly developed personnel. In addition, wild life enters so much into the welfare and pleasure of every individual, often in ways unsuspected, that the dissemination of correct information about it to the general public is of the highest importance if this life is to fulfill its highest mission.

It is thus apparent that in the conservation of wild life, as in that of forests, we must have recourse to research, education, educational extension, and State administration. And in this field again all of the institutions represented on this committee are interdependent and must function collectively. How true this is will be more clearly apparent upon consideration of some of the work in hand within the last two or three years.

The problem of clearing streams of pollution is largely a problem of wild life conservation, with unsolved biological questions of far reaching importance. For instance, it was pointed out in the last Annual Report of the Conservation Commission that, whereas it was formerly supposed that dairy wastes were destructive to all fish life, it had been ascertained by investigations made by the biological staff of the State College of Agriculture at Cornell University that in some instances, on streams of a certain type, dairy wastes result in the production of enormous quantities of blood worms, which drift down into larger streams and provide food for desirable fishes. There is further reference to this sub-

ject in the Annual Report of the Commission for the current year, where cooperative work of a biological nature now being conducted by the College of Agriculture is outlined. The entire work of improving the quality of water courses is bound up with the solution of biological problems.

In 1916 the Conservation Commission undertook for the first time a survey of the water courses of the State, for the purpose of making working plans for planting the product of the fish hatcheries. This is an administrative investigation quite as important as a land classification survey before reforestation, or a soil survey to determine the best crops to be planted on a given area.

The perennial contest over the buck law, when biological assertions diametrically opposed to each other have been advanced with the utmost ardor, furnishes one of the most striking illustrations of the necessity for dependable, scientific facts about wild life.

It will be seen upon referring to the section on biological investigations in the current Report of the Conservation Commission that the enormous number of approximately 400,000 muskrats were reported trapped in 1918. Whether muskrats are breeding fast enough to withstand such drain is of fundamental importance for the continuation of the supply.

The decrease in the grouse of two or three years ago showed the need for more accurate knowledge of this bird, for the purpose of checking if possible its downward trend.

We must remember that we cannot in any one season kill more than the annual increase of wild life without impairing the reserve breeding stock, and this indicates the necessity of a continuous running check upon the numbers killed, and the relative abundance from season to season, particularly with such a dense population and such intensive hunting conditions as New York State presents.

Because of the high value of foxes, the United States Biological Survey has established experimental fur farms in various places, for the purpose of solving problems of domestication and selective breeding.

These cases illustrate but the beginning of a new era in wild life conservation, an era which will be characterized by admin-

istration of these valuable resources on a basis of scientific inquiry and definitely ascertained fact instead of on the basis of prejudice, guess work, and popular clamor, which has so often characterized it heretofore, when neglect has not predominated. It is an era which recognizes the important function of scientific investigation, the need for trained men, the necessity for education of the public, and the importance of more adequate State administration.

Conservation Agencies

New York State is to be congratulated that it has already in existence effective machinery for the conservation of forests and wild life. Facilities for research, education, extension teaching, and administration have been in operation for a long time, and have been brought to a high state of development. Unfortunately, however, they have not yet been properly coordinated, nor have steps yet been taken to vigorously advance the cause of conservation by the collective functioning of all of these agencies. The concurrent resolution under which this committee now exists offers the first opportunity for such coordinated work. If proper advantage is taken of this opportunity, there is every reason to believe that work of great value can be accomplished within the next few years by the united endeavor of all of the State's conservation agencies. The committee believes that no other state has such well developed agencies, backed by such complete laboratory facilities and manned by a personnel of such specialized training in the whole field of forest and wild life conservation, as has New York. The opportunity for constructive work is accordingly great, and to fail to make the most of it would be inexcusable.

The particular field of activity of each institution and its facilities for the conduct of its work are outlined in the following paragraphs.

NEW YORK STATE COLLEGE OF AGRICULTURE

The function of the New York State College of Agriculture at Cornell University is, with reference to the questions under discussion,

(1) To conduct teaching, research, and extension in forestry as a phase of agriculture, in accordance with the terms of the

Administration Act of the College (Chapter 218, Laws of New York 1906) and of the Land-Grant Act of 1862.

(2) To conduct teaching, research, and extension in biology, the science of plant and animal life, including its subordinate branches:

(a) Game farming and wild life conservation, in accordance with special authorization therefor (chapter 747, Laws of 1917).

(b) Fish culture, on the basis of its organization for this work definitely established as a phase of biology in 1906 and gradually developed as a regular part of the work of the College since that date. (Chapter 218, Laws of New York 1906; Land-Grant Act of 1862).

The Work in Forestry

The Teaching of Forestry. Agriculture is the raising of products from the land. The State College of Agriculture approaches forestry from the standpoint of agriculture. The forest is a crop, differing from other crops in the details of its handling, but not in its essential features. The teaching of forestry is an integral part of a fully developed college of agriculture, using the word agriculture in the broad sense in which it has long since been applied in colleges of agriculture throughout the United States, in agricultural experiment stations, and in the United States Department of Agriculture of which the National Forest Service is a component part, along with plant industry, animal husbandry, and the like. The forest crop is produced partly on farms and partly in segregated areas or so-called forest regions. Of approximately 14,000,000 acres in forest areas in New York State, 4,600,000 acres are in the Adirondack forest region, 1,200,000 acres are in the Catskill forest region, 4,100,000 acres are in farm woodlots, and the other large areas best suited for a forest crop, approximating 5,000,000 acres, are on lands now or previously largely enclosed within farm boundaries. According to the census of 1910, New York held second rank among the states of the Union in the value of farm forest products, producing more than one-twentieth of the total farm forest products reported in that year.

We have come to speak of farm forestry. There is, of course, no such thing as farm forestry except as a designation of place where the work may be done. The management of a forest tract, whether on a farm or in a segregated forest region, involves the application of the general principles and practices of good forestry — the principles embodied in professional forestry. The general principles of forestry must be applied to the farm forests. Failure to recognize this fact fully, and the tendency to assume that the care of the farm forest is a superficial sort of undertaking, is responsible in part for the neglect and consequent unproductive condition of one-third to one-half of the State's entire present and prospective forest area which is now within the confines of farms. It is not necessary that the prospective farmer should have full professional training in forestry. He should receive instruction in the general principles and practices of forest operation and development as he does in other farm operations; but there should also be opportunity for those who desire to train themselves fully in this line.

The State College of Agriculture is prepared to meet the following three forestry needs: the giving of full professional training, the giving of limited particularized training, and the giving of informational courses for the general student. In the College of Agriculture the whole subject has been developed from the agricultural viewpoint to meet the necessity of making the instruction substantial. This instruction must be handled by professionally trained foresters. The opportunity to give full collegiate work retains on the University faculty men of the training and ability required to give good instruction to university students. To provide for this work the State Legislature by specific act has provided a Forestry Building and the necessary equipment. Facilities are now available at the college for the adequate instruction of professional forestry students to a number that is not likely for some time to come to tax the physical capacity of the department.

It may be pointed out in passing that full collegiate forestry courses are now developed in the Land-Grant institutions in California, Minnesota, Washington, Michigan, and others as well as in New York. The beginning in New York was made in 1898, with the establishment of the New York State College of Forestry at Cornell University. At that time, the instruction in agriculture

was maintained chiefly on the private endowments and Federal grants of the University. Through failure of the State to make an appropriation therefor, the State College of Forestry ceased to function in 1903. The year following, however, the State created the New York State College of Agriculture at Cornell University, and in 1910 forestry was established as a department of instruction therein.

Forestry in the State College of Agriculture ranks in place and opportunity coordinate with other fields of instruction. In an institution for the higher education, such as Cornell University, all instruction must be of university grade or standards; otherwise it would not be tolerated. In every department of instruction there must be opportunity for specialization, for advanced and post-graduate study. The opportunity to do advance work in each department of instruction is inherent in the university organization. The institution must offer students desiring to pursue any phase of the broad field of agriculture the opportunity to follow that subject to the best and fullest advantage. Cornell recognizes this obligation as regards forestry by conferring the degree of Master in Forestry on the completion of the five-year professional course, the degree of Bachelor of Science being given at the end of the fourth year.

In teaching the economics of agriculture and the problems of farm management, both of which are of outstanding importance in the curricula of colleges of agriculture, the forest areas must be considered as part of the agricultural or farm domain. Forest cropping is as essential a part of the instruction as animal husbandry or fruit-tree growing. These agricultural subjects interlock. They are alike necessary to complete and rounded instruction in agriculture.

The point of view at Cornell is that the study of forestry is to be approached from the side of crop production and the best permanent use of the land; that essentially the forester's job is the raising, caring for, and harvesting of successive crops of timber and other forest products; that forestry is primarily a land problem.

Under the existing organization in the State College of Agriculture the staff necessary to meet the forestry requirements of instruction in agriculture is able also to give the necessary

advanced and post-graduate instruction in professional forestry. To teach forestry in the State College of Agriculture requires but comparatively small additional financial outlay, as is revealed by the appropriation for this institution. (Total State appropriation for salaries and maintenance of the Department of Forestry, exclusive of heat, light, and water, which are included in general college appropriations, is \$29,110.00 for 1920-21.)

Professional education in forestry requires, among other things, basic instruction in botany, meteorology, biology, plant physiology, zoology, entomology, plant pathology, surveying, and soil technology. In the State College of Agriculture all of these subjects are already highly developed for the students in general agriculture and so do not need to be duplicated for the students in forestry. The existing arrangement makes it possible for the forestry students in the State College of Agriculture to work under teachers of established reputation; and the facilities are already available for the training of specialists in such fields as forest entomology and forest pathology.

With the growing realization of the importance of the farm woodlot, resulting from the educational extension in cooperation with the farm bureaus, there promises to develop a demand for professional foresters who have specialized on the problems of the farm woodlot. The State College of Agriculture is particularly well fitted to meet this need.

Research in Forestry. Research and teaching are correlated and interdependent and cannot be separated in college or university organization. Research may thrive alone, but good university teaching cannot thrive apart from research. It is impossible to segregate fine scholarship from research. The educational institutions the world over have been the chief sources of advance in scientific endeavor. Their range of investigation has been as wide as the limits of learning. It is impossible long to maintain any department on a university basis if research is lacking. To advance in knowledge is indispensable. The universities must train creative minds, and they can do this only when their teachers engage in creative work, that is, in scientific research. No educational institution can hold a place of leadership unless it is constantly advancing into new ranges and widening the boundaries of knowledge.

No hard and fast line can be drawn between the acquisition of new knowledge, which is research, and its dissemination, which is teaching. Post-graduate students as part of their required training undertake investigations into new fields of knowledge.

Extension in Forestry. Agricultural extension work had its beginnings in this country in the nineties of the last century at the College of Agriculture at Cornell University. Beginning in the nineties and continuing until the establishment of the State College of Agriculture, the Legislature made special annual appropriations to the College for this purpose. In the Administration Act of 1906, extension teaching was defined as one of the three coordinate lines of work to be undertaken by the New York State College of Agriculture. Since that time there has been large development of the extension service of the College. In 1914, the Federal Congress passed the Smith-Lever Act establishing cooperative agricultural extension work with the Land-Grant institutions,— Cornell University is the Land-Grant institution in New York State,— which provides gradually increasing appropriations of federal monies to be offset by the states, the minimum of which for New York State, on and after 1923, will approximate \$330,000 annually, about \$170,000 coming from the Federal Congress and at least \$160,000 from the State. Under the terms of State and Federal laws this money is applied to the extension service of the State College of Agriculture at Cornell University. On the basis of this law there is a signed agreement between the Secretary of Agriculture and the President of Cornell University providing for cooperation in the extension activities of the United States Department of Agriculture (which includes the Forest Service) and the State College of Agriculture, the administrative officer of the joint work in the State being the Director of Extension who is the Dean of the State College of Agriculture. On the basis of these funds and under the terms of the agreement with the Secretary of Agriculture, and as a phase of the Cooperative Extension Service, there have been placed in fifty-five counties (the agricultural counties) in New York, one or more county agents for the promotion of the agriculture of the counties. Subject-matter extension specialists in farm crops, animal husbandry, forestry, and all other departments of the State College of Agriculture conduct their extension work through

and in cooperation with these county agents. This vast and highly efficient organization, supported by the consolidation of the State College and Federal department extension forces, provides incomparable machinery for the promotion of extension in the whole field of agriculture and country life.

The educational extension in forestry now proceeding from the Department of Forestry in the State College of Agriculture includes, among other things, instruction in forest planting; cleanings and thinnings in immature woodlands; improvement cuttings on more mature woodlands; assistance and demonstrations in the management of woodlands; the furnishing of information on methods of appraisal of woodlands and the profitable disposal of timber and other forest products, such as maple sirup and sugar; the reforestation of non-agricultural lands within the boundaries of farms. The development of forests on the non-agricultural areas on farms is the particular sphere of forestry as a phase of extension teaching. The extension education seeks also to create an intelligent public opinion with reference to the importance of adequately safeguarding the timber supply.

The Work in Biology, Including Wild Life Conservation

Biology, which is the science of life, plant and animal, is fundamental to all agricultural teaching and research. It embraces the whole field of living things. The various acts under which the New York State College of Agriculture exists, and the broad field in which it functions, have made necessary the development of effective facilities for work in biology, of which wild life conservation is one of the important branches.

It would be impossible to train men and women for all of the manifold phases of agriculture without ability to impart a sound foundation in biology. Problems of biology touch farm life at literally hundreds of points. The selection, care, and breeding of domestic stock involve biology. If this stock is to be improved by the addition of wild strains, we are taken out of the domestic field and into that of the wild. The growing of crops is influenced by animal and insect pests. These in turn are often held in check by birds or wild animals, and thus on the farm we find it of the utmost necessity to conserve many desirable species for the preservation of agriculture itself. Many forms of wild life upon

the farm, or capable of being developed there, can be made to provide an important revenue. Thus a well rounded college of agriculture must study and give instruction in all these fields. Furthermore, all plants and animals now under cultivation were derived from the wild state; and nature has not yet exhausted her contributions to the needs of mankind. Her further gifts must be continually sought.

As these subjects are followed out into their various ramifications, new fields for specialization are opened, which invite the most intensive work of experts. The College must accordingly provide courses for the training of men who are to devote their lives primarily to a single branch of biological knowledge, such as entomology, fish culture, or any of the many subdivisions of zoology.

The New York State College of Agriculture has endeavored to meet the obligations imposed upon it in this field. Its equipment for biological research, teaching and extension is unsurpassed, and the personnel of its faculty is as strong as any to be found in this country. For years it has turned out men who have taken high rank in the practical application of biological principles and the development of new knowledge.

As the subject of conservation of wild life assumed increasing importance, principally within the last ten years, the College was able, because of its existing equipment, to devote special attention to it, and to be among the first institutions to initiate special courses in conservation. With the machinery and personnel already developed, it thus had practically no additional expense. The curriculum furnishes the scientific training essential to those who plan to make conservation their life work, and the courses regularly offered permit specialization in many directions. A four year course leads to the degree of Bachelor of Science. A shorter course is designated for the training of those who wish to take up game protection or become keepers of game preserves or game farmers.

The facilities for research, without which such courses could not have been developed to the high plane which they have attained, are equally strong, and offer the means for solving many of the State's still unanswered questions of wild life conservation.

The Work in Game Farming. By Chapter 747 of the Laws of 1917, there was established at Cornell University, as part of the State College of Agriculture, and as an outgrowth of the work already developed, a state experimental game farm for the purpose of conducting investigations in the breeding and rearing of game and the giving of instruction in the same. The State has since invested approximately \$30,000 in facilities and has provided a staff and operating expenses for the work. The function of this experimental game farm is to conduct experiments in the propagation and management of game birds and mammals for food, fur, and sport. Seven specific investigational projects are now under way, which are basic in game breeding and rearing. They embrace problems in the selection of feeds; studies in heredity; the establishment of pedigreed strains; artificial hatching to multiply rate of reproduction; artificial rearing, including feeds and appliances; special feeding of selected breeding stock; and other studies in propagation. Incidental to the experimental work surplus stock is obtained, which is placed at the disposal of the State Conservation Commission, which cooperates in the work, for distribution. Provision is also made for public lectures, demonstrations, exhibits, field visits, and publications to make known to the public the results of experimental work on the game farm.

Game farming is conducted with economy at the State College of Agriculture because a large part of the necessary instruction in fundamental and applied biological science is already available as part of the agricultural curriculum: zoology, botany, entomology, physiology, bacteriology, chemistry, embryology, histology, mammalogy, ornithology, limnology, forestry, fish culture, farm management, animal husbandry, genetics, farm crops, and, in poultry husbandry, such subjects as incubation, brooding, diseases, sanitation, feeding, breeding, and housing. With the high development of the work in the broad fields of biology and poultry husbandry; with research specialists already on salary with work long under way; with excellent general and technical libraries containing the accumulations of a half century in these related fields; and with a farm already purchased by the State which provides superior advantages as regards shelter, quality of the soil

slope of the land, natural cover, air and water drainage, abundant vegetative and insect life, and perpetual streams of pure water, the opportunities for a high development of the fields of game farming and wild life conservation are unexcelled. In the field of resident instruction, more than one hundred students have taken courses in game farming during the past three years.

As the Federal Biological Survey is coordinate with other units in the United States Department of Agriculture, so are the biological activities involved in game breeding and rearing and fish culture coordinate with other activities in the State College of Agriculture.

The Work in Fish Culture. New York State possesses exceptional water conditions for successful fish raising. When one considers all of the streams, springs, and swamp lands now going to waste so far as food production is concerned he wonders why the State has not heretofore undertaken the intensive study of these natural resources. Furthermore, there are few farms which do not have enough water of the right quality to supply one or more fish ponds. Calls which have come to the State College for years have indicated that large numbers of farmers will undertake the propagation of fishes just as soon as information of the right sort can be given them. There is also a demand among students of agriculture for instruction in practical fish culture.

Before fish production can be materially increased, careful investigations must be undertaken for the following purposes:

(1) *Devising methods for increasing the productiveness of our public waters.* This problem is of national interest. In our own State it has been quite generally discussed among fishing club members and in the meetings of the New York State Fish, Game and Forest League. The general opinion strongly favors scientific investigation of our streams and lakes with the idea of improving them from the fisherman's standpoint.

(2) *Improving wild fishes by selective breeding.* Fishes are susceptible to the same improvement as were the wild cattle, wild horses, and the jungle fowl. Enough of this selective breeding has been accomplished with the carp to prove the assertion. Breeding of improved cultural varieties of our better native fishes offers a most promising field.

(3) *Devising methods for rearing fishes economically to marketable size.* This has not yet been done in America except by trout breeders and even they must obtain high prices for their products to make the investment pay. The chief problem here concerned is that relating to food. As soon as a natural food can be propagated economically, it will be possible to reduce the price of trout. This likewise applies to any fish reared in the farm pond. The existing fish hatcheries raise fry. The raising of mature fish economically waits on the solution of the feeding problem and problems in fish pond management.

(4) *The study of fish diseases, their prevention and their cure.* It has been found lately that large numbers of wild fishes as well as those raised in hatcheries are afflicted with various diseases, including goiter and others of parasitic origin. Methods for preventing these must be created, if we are to get clean and wholesome fish in the future and if fish are to be raised in domestication.

In 1911 applied work in aquiculture was established, both teaching and research, and a small experimental hatchery was built in Cascadilla Gorge. A large amount of investigation has been done there to test the relative value of various artificial fish foods, and one bit of this work won for the investigator in charge last year the first prize of the American Fisheries Society for the best work in fish culture.

Reasons why the fish cultural work and studies in aquatic life should be extended at Cornell University include the following:

(1) The State has already a considerable investment in work that is now yielding returns. Aside from the staff of specialists and the biological field laboratory at the head of the lake, with an additional lot and boat house on the shore, the existing equipment consists of a fireproof experimental hatchery in Cascadilla Gorge, a large fish cultural experiment station building on Cascadilla Creek on the College farm, rowboats, seines, and other collecting apparatus, equipment for raising aquatic organisms, equipment for sampling wet soils and soil waters, and laboratory apparatus in limnology and aquiculture as well as highly developed facilities in the broad fields of zoology, entomology, and biology.

(2) The location at Ithaca is exceptionally fine for work because of two conditions:

(a) The natural environment, with every sort of fresh water from farm streams and marshes to deep lake water. The College farms are abundantly supplied with fresh water streams.

(b) The presence of experts in all related fields, whose knowledge and advice may be obtained when needed and without additional expense.

(3) The ownership of field station property.

(4) The ownership of twenty acres of land at the head of Cayuga Lake which is unexcelled for the development of the enterprise.

(5) The existence at the College of a laboratory of parasitology for the study of fish parasites.

(6) The existence of a state-wide extension teaching system to show the owners of many thousands of acres of waste wet land how to make some of this land more productive than by draining and at less cost.

NEW YORK STATE COLLEGE OF FORESTRY

No statement regarding the New York State College of Forestry at Syracuse University had been received from Dean Moon up to the time when it became necessary to send the manuscript of this report to the printer. There is accordingly inserted here the following memorandum regarding the forestry work at Syracuse, prepared by other members of the committee on the basis of published material emanating from the New York State College of Forestry, and of conversations had with Dean Moon by these members of the committee, at various times.

Under the charter of the college, granted in 1911 by the Legislature of the State of New York, the New York State College of Forestry at Syracuse University is obligated to carry on two important and coordinate lines of work: first, special research and state-wide investigation in forestry that will help in the

solution of forest problems which are now confronting the State and the people of New York; and second, the giving of instruction in the several branches of Forestry to young men at the College at Syracuse. To these has been added a third major branch of activity, the conducting of general educational work throughout the State by the Extension Service of the college.

The original charter has several times been amended to permit the College to broaden the functions imposed upon it by the State. These amendments were enacted at the legislative sessions of 1913, 1918 and 1919. The duties with which the college is now charged are set forth in the following extracts from these laws:

Section 2. Objects and purposes of college. The college shall have for its objects and purposes:

1. The teaching and instruction of its students in the science and practice of forestry and its several branches, including municipal and landscape forestry, forest engineering and surveying, botany, zoology, entomology, ichthyology, silviculture, forest pathology, wood preservation, utilization and distillation, and the manufacture and marketing of forest products.

2. The carrying on and promotion of investigations, experiments and research in forestry and its several branches in field and forest, class-room and laboratory and in industrial and commercial plants, also like investigations, experiments and research in relation to the habits, life histories, methods of propagation and management of fish, birds, game, food and fur-bearing animals and forest wild life.

3. The conduct upon land acquired by purchase, gift or lease for such purpose, and otherwise of such experiments in forestation, reforestation, the development of forests for public, commercial and recreational purposes, the protection of water courses and subterranean waterflow, the protection and propagation of the animal life of the forest and forest waters, and, generally, the giving of popular instruction and information concerning the elements of forestry, the effective marketing of forest products, and of practical tree-planting throughout the State, as the board of trustees shall deem most advantageous to the interests of the State and the advancement of the science of forestry.

4. The planting, raising, cutting and selling of trees and timber at such times, of such species, and quantities and in such manner as the board of trustees deems best, with a view of obtaining and imparting knowledge concerning the scientific management and use of forests, their regulations and administration, and the production, harvesting and reproduction of forest crops and the earning of revenue therefrom.

Section 4. Powers and duties of board of trustees. The board of trustees of the college shall have the general care, supervision and control thereof, of its officers and its activities and to carry out its objects and purposes shall have the power:

3. To prescribe the course of instruction and the methods of investigation, research and experiments to be pursued in the college, and the degrees to be conferred on graduation therefrom, and on those taking postgraduate courses therein.

4. To enter into any contract necessary or appropriate for carrying out any of the purposes or objects of the college, including such as shall involve cooperation with any person, corporation or association or any department of the government of the state of New York or of the United States in laboratory, experimental, investigative or research work and the acceptance from such person, corporation, association or department of the State or Federal government of gifts or contributions of money, expert service, labor, materials, apparatus, appliances or other property in connection therewith.

5. To establish and conduct an experimental station to be known as "Roosevelt Wild Life Forest Experiment Station," in which there shall be maintained records of the results of the experiments and investigations made and research work accomplished; also a library of works, publications, papers and data having to do with wild life, together with means for practical illustrations and demonstrations, which library shall, at all reasonable hours, be open to the public. (Chapter 42, Laws of 1918, as amended by chapter 536, Laws of 1919.)

Technical Education. In its work of training men for the practice of forestry in its many phases, the New York State College of Forestry offers undergraduate courses in general forestry,

paper and pulp making, logging and lumbering, city forestry and forest engineering, all leading, after four years of undergraduate work, to the degree Bachelor of Science. Special opportunities are also offered for post-graduate work leading to the degrees Master of Forestry, Master of City Forestry, and Doctor of Economics.

On account of the need of thorough training, the college does not consider its graduates technical foresters until they have completed the five years work and received the Master's degree. Those who leave college with the B. S. degree only are to be regarded, rather, as college trained apprentices. In all cases a period of experience and practice must be undergone after graduation for a man to become thoroughly skilled in the application of his training. The four-year man is fitted, ordinarily, only to hold minor positions.

Emphasis in forestry instruction at Syracuse has always been placed on the definition that forestry includes, as well as silviculture—the art of timber production—the utilization of the forest from the tree to the finished product. In some parts of the United States, questions of forest finance, wood utilization and the economical merchandizing of the finished products are at present paramount to crop production. For this reason the college has given special attention, both in its instruction at the University and in its research work, to this aspect of the question. It has been consistently maintained by the college that while forestry is a part of the great land problem of the nation, it nevertheless approaches it from the standpoint of engineering rather than from that of agriculture. In furtherance of this conception, the college has emphasized to its students the importance of forestry in the industrial life of the country and has from the start encouraged its graduates to enter the industries that manufacture and use the products of the forest. To men of executive ability the field is broad and offers quite as great inducements as do the forest services of the Federal government or of the several states. That there is demand for men so trained is clearly evidenced by the number of graduates of the college who have been placed in positions in the forest industries.

The New York State College of Forestry also recognizes that

there are other ways in which the forests may be utilized, that are to be regarded as legitimate phases of forestry. In addition to the function of producing timber crops, the forests are being used by the public to an increasing degree as places of rest and recreation, for hunting and fishing and as a means of increased food production from grazing animals, fish and game. In order that they may produce to their maximum, the woodlands require the care of the trained forester who, in addition to his knowledge of silviculture, also is thoroughly conversant with methods of preventing and controlling injurious insects and fungus diseases, and who has a knowledge of wild life and the principles of park management. Intimately connected with this is the training of men for work in the National Park Service, which seems destined to a parallel development to that of the Forest Service.

So too with the care of the individual trees used in our streets and highways, our city parks and our home grounds. The selection, design, care and control of such urban tree planting requires men with training in arboriculture and landscape architecture as well as in such branches of forestry as silviculture and dendrology. Men with such training form the material from which modern city foresters are made.

The day of the forest specialist is here. There is place in the profession for the administrator, for the man attracted by any of the various biological problems of the forest community, for the chemist, and for those interested in any of the other phases of utilization. Each has his field. The combined work of all types of men is needed in order that the broad science and art of forestry may develop and yield its maximum service to the State and the nation.

In addition to its educational work at the University at Syracuse, the New York State College of Forestry maintains a one year course of practical training at the State Ranger School in the Adirondacks, on an 1,800 acre tract at Wanakena, N. Y. In this school men are trained to fill such positions as guards, rangers, nursery foremen, etc. Short courses in specialized branches of forestry, as for dry kiln engineers, paper and pulp makers, and timber graders are also offered by the college, at intervals, as

occasion requires. Courses of this character will be given for the third season, in March and April 1921, concluding with the Second Annual Forest Week, an occasion when visitors may obtain an excellent idea of the various activities of the College of Forestry.

Research. In its research work the New York State College of Forestry holds that its field is state-wide and that it embraces all the branches of forestry and allied subjects that are covered in the curricula of its several courses of technical education. In every educational institution worthy of the name research and teaching go hand in hand. No college teacher can even keep abreast of his subject successfully without the inspiration that comes from original investigation. Accordingly at Syracuse especial emphasis is placed upon research, not only in the technical branches of silvics, silviculture and utilization, but as well upon subjects that lie in the closely allied fields of botany, entomology and in the study of wild life, both of land and water, that has in any way to do with the forest.

The New York State College of Forestry is fortunate in having a number of parcels of land on which demonstrational and experimental work can be carried forward. These include a nursery and planting area adjacent to Syracuse, the Ranger School tract of 1,800 acres in the Adirondacks, and three other tracts; one in Cattaraugus county, one in Madison county and one in the Catskills.

Two lines of research that are receiving the attention of the New York State College of Forestry are the investigations in phytopathology, with especial reference to disease and decay in important forest trees, and those in forest entomology. In the latter field an exhaustive investigation is under way that aims to gather all the biologic and economic data possible with relation to insects that have as their hosts the forest trees of New York State. A considerable number of scientific papers have already been issued by members of the college staff dealing with this problem.

The practical importance of forest entomology and forest pathology is only just beginning to be recognized in this country, but with the inevitable development of more intensive forestry it is

coming to be seen that fire is by no means the only agency which can wipe out vast areas of valuable timber. The forest is a community comprising both plant and animal life. The need for men capable of undertaking investigation and control work along these lines will certainly increase.

In addition to the facilities for investigational work in silviculture and the sciences allied thereto, the college is working in cooperation with industrial plants and conducting experiments that have to do with the closer utilization and consequent prevention of waste, of valuable forest products. This makes possible an intimate association between certain forest industries and the faculty and more advanced students of the college. The Eastern Forest Products Laboratory, established in the College of Forestry building at Syracuse, is intended further to contribute to the better knowledge of wood and of the uses to which various species can and should be put.

Of especial interest at this time is the work projected, with some of it already started, by the College of Forestry, through the medium of the Roosevelt Wild Life Forest Experiment Station, authorized by an amendment to the charter of the college passed at the legislative session of 1919. The purposes sought to be accomplished are thus set forth in that law: "To establish and conduct an experimental station, in which there shall be maintained records of the results of the experiments and investigations made and research work accomplished; also a library of works, publications, papers and data having to do with wild life, together with means for practical illustrations and demonstration, which library shall, at all reasonable hours, be open to the public." (Chap. 536, Laws of 1919.)

The possibilities in connection with wild life are almost unlimited. Fish and game have in the past been valued chiefly for the sport and recreation they furnished. Recent developments prove conclusively that the lakes and streams in our forest areas are capable of producing enormous quantities of food. Investigation of this aspect of forest life is certainly needed. One of the objects of the Roosevelt Wild Life Forest Experiment Station is to collect and compile just such data, with especial relation to the phases of this problem that have an economic bearing.

Extension Activities. The third main division of the work of the New York State College of Forestry is its extension activities. These cover a broad field and touch many and varied interests in the State. An important part of the work consists in the giving of lectures before a great variety of audiences, both in the country and in towns and cities; in demonstrations, particularly in the way of reforestation projects; in assistance to forest and woodland owners in the preparation of plans for forest management, and in special activities, as in connection with the Boy Scout movement. All of this work is backed up by a liberal use of the various devices of modern publicity, by which the people of the State have constantly kept before them a wide range of topics of forest interest. The interest so manifested shows the continuing need for extension work in forestry in this State.

A useful function of the New York State College of Forestry is the special service which it renders to both producers and consumers of forest products in the way of special market investigations, the development of markets for by-products of the forest, and studies in the closer utilization of waste material. The College tries in these ways to bring producer and consumer together to their mutual advantage. In connection with this work it should be stated that the New York State College of Forestry is now cooperating with the United States Forest Service in a survey of the wood using industries of New York State, a project that should prove of value to many persons.

The New York State College of Forestry in its location at Syracuse occupies a strategic position as regards the forests of the State. The College is housed in one of the best and most efficiently equipped forestry buildings in the United States, built for it by the State at a cost of \$250,000 and occupied by the College since 1917. With these advantages, plus the areas of forest land that it controls, and the men, technically trained in education and in research, who make up its staff, the New York State College of Forestry stands ready to meet any demands that are made upon it.

The College believes that forestry covers a broad field and that it includes many other subjects as well as the growing of trees

this committee, the work of the educational agencies supplementing that of the Commission and carrying it further.

This report is not signed by Dean Franklin F. Moon of the New York State College of Forestry at Syracuse University for the reason that Dean Moon has notified the Committee that he does not endorse it. Dean Moon has been provided with manuscript and proof of the report in its various stages of preparation, and his points of disagreement with this report are stated in his Minority Report which follows.

The majority members of the Committee, upon reading the Minority Report, have felt that it is unnecessary to take detailed issue with all of the points contained therein, though they find themselves unable to subscribe to the accuracy of certain statements. They have felt that quibbling over these points might easily become endless, and would lead to no constructive results. The chief questions which they have had in mind in approaching their task under the concurrent resolution have been:

What are the most urgent needs in the conservation of forests and wild life?

What agencies has the State available for meeting these needs; and how well are these agencies equipped?

How can the work be distributed among these agencies in such a manner as to avoid duplication and at the same time enlist the best efforts of each agency?

With all of these questions correctly answered, there is work enough for each institution, and by their united effort conservation can be very materially advanced.

Respectfully submitted,

GEORGE D. PRATT,

Conservation Commissioner;

ALBERT R. MANN,

*Dean of the New York State College of
Agriculture at Cornell University;*

JOHN M. CLARKE,

*Director of the New York State
Museum.*

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MINORITY REPORT

To the Honorable, the Legislature of the State of New York:

The New York State College of Forestry at Syracuse University, while represented at the preliminary hearing, does not concur in the resolutions and recommendations, largely on account of the extremely partisan tone and biased attitude reflected in these recommendations. The facts are as follows:

1. Forestry, tho a land problem, is separate and distinct from agriculture. To consider that agriculture includes forestry because they are both concerned with crop production is absolutely fallacious. This was recognized in 1898 when the State Legislature established at Cornell the New York State College of Forestry separate and distinct from the College of Agriculture which was in existence at that time in the same institution.

Instruction in professional forestry at Cornell was continued from 1898 to 1903 when the State College of Forestry was discontinued.

2. When the State College of Forestry was organized at Syracuse, according to chapter 851, Laws of 1911, there was not within the State of New York any institution of learning that performed the *functions* of such a college. However, since 1914, Cornell has been teaching professional forestry, claiming it to be a phase of agriculture, clearly a duplication of the work belonging to the State College of Forestry.

3. Following the established European practice, the College has considered all problems of the forest community (the full use of every possibility of the non-agricultural soils of the state) to belong to the foresters' realm. Consequently, the wild life of lake and stream and forest is a part of the forestry problem. The New York State College of Forestry which existed at Cornell University 1898-1903 contained within its curriculum instruction and research in fish and game.

4. The Trustees of the New York State College of Forestry have insisted that the original purposes of the College should be adhered to — (a) resident instruction in all phases of forestry, (b) research in forestry problems, including wild life and utiliza-